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AMBROSIA BEETLES IN FOREST AND SAWMILL

Their Biology, Economic Importance and Control

By

R. C. FISHER,[i] G. H. THOMPSON[ii] AND W. E. WEBB[iii]

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INTRODUCTION

THE Sixth British Commonwealth Forestry Conference in Canada, 1952, provided a valuable opportunity for drawing renewed attention [45] to a forest and timber insect problem that has become of major economic importance with the increased exploitation of many of the lesser known tropical hardwoods. The type of defect commonly known as pinworm, pinhole, or shothole damage, caused by ambrosia beetles, has long been regarded as a characteristic feature of many timbers, particularly from the tropics, and until comparatively recently its presence has usually been accepted without serious question as unavoidable. Such is no longer the case, and there is widespread interest in the development of any practical and economic method of preventing these defects, which experience in many parts of the world has shown to cause serious financial loss and to restrict the full utilization of many valuable timbers.

Information on the habits, economic importance and control of the insects responsible is comparatively meagre and, scattered throughout many scientific and technical journals, is not easily available for consultation. In the present article an attempt is made to summarize existing knowledge in a form useful not only to the entomologist, but also to the forest officer, sawmiller, timber importer and merchant, manufacturer, and all directly concerned in the fullest exploitation and use of the world's timber resources.

CLASSIFICATION AND NOMENCLATURE

Amongst the best known forest insects are the barkbeetles of the family Scolytidae, of which some genera, together with beetles of the closely related Platypodidae, are timber borers which enter the sapwood and sometimes the heartwood of trees and logs, causing the well-known type of defect in sawn timber described according to the size of the holes as pinhole or shothole borer damage. The Scolytidae occur in both temperate and tropical regions and include some 22 genera, of which the principal are *Xyleborus*, *Trypodendron*, *Gnathotrichus* and *Anisandrus*. The Platypodidae are better represented in the tropics, and embrace some 14 genera of which the most important are *Platypus*, *Crossotarsus*, *Diapus* and *Webbia*. Some of these genera, e.g. *Xyleborus* and *Platypus*, each include over 200 species. The taxonomy of these wood-boring Scolytids and Platypodids has been dealt with

(i) Forest Products Research Laboratory, Princes Risborough. (ii) Imperial Forestry Institute, Oxford.
(iii) West African Timber Borer Research Unit (Colonial Office).

in publications from various parts of the world, notably North America [104, 11, 31], India [10], Malaya [13, 14, 17, 18, 28], Europe [40], and the United Kingdom [82], but information on species from tropical Africa is confined to two recent papers [58, 92].

Although the Scolytids and Platypodids differ markedly in appearance and structure, they share a common mode of development in that both beetles and larvae derive their nourishment from a mould type of fungus to which the name 'ambrosia' has been given, introduced by the beetles into their tunnels, on the walls of which it grows and is propagated. This has led to the use in most countries of the common name 'ambrosia beetle', but the term pinhole borer, which probably originated in the United States [100] with stave-makers and coopers, who plug with small wooden pins the holes made by the insects, is also used, particularly in the United Kingdom. The name 'shothole borer' is commonly applied in India and Malaya [16] to the larger species responsible for holes corresponding in size to various small shot up to about 2·5 mm. in diameter. The same name is, however, used to describe infestation by powder-post beetles of the family Bostrychidae, of quite different habit and not in any way associated with fungi. For these reasons the universal use of the accurately descriptive term 'ambrosia beetle' would avoid confusion or misunderstanding.

Biology

In a short review such as this it is difficult to generalize on the morphology or biology of this group of beetles as a whole, since each of the many species presents some aberration from the general. This variation may be due to generic or specific habits; to climatic differences, since they range from the Equator to the far north and south; to the species, size and condition of the hosts, which vary from sugar beets, tea and coffee bushes and forest trees, to logs, lumber and rum puncheons; and to a number of other variable factors. It is therefore possible only to summarize in broad outline the salient features of present-day knowledge of their morphology, habits and general biology.

Description of the Insects

The ambrosia beetles, like other Coleoptera, pass through four complete and entirely dissimilar stages.

Egg. The eggs are very small, ranging from 0·5 to 1·0 mm. in length and from 0·3 to 0·7 mm. in diameter, ovate in shape, and a translucent white. The egg shell or membrane is very thin and delicate in the case of eggs deposited in special egg-niches, but thicker and tougher in eggs deposited free in the adult tunnels. A single female lays from 10 to more than 200 eggs over an extended period and usually only one egg is deposited at a time. Hoffmann [59] dissected several females of *Xylosandrus germanus* (Blandf.) and found only one egg in a mature state in the ovaries at any one time. The average period of incubation varies from 5 days to a month, but is affected by climatic and geographic conditions.

Larva. The larvae vary greatly in size, ranging from 1 to over 11 mm. in length and from 0·3 to 2·5 mm. in diameter. They are creamy white in colour, cylindrical and apodous. When full grown they fit tightly into the tunnels made by the beetles, and move by a progressive expansion and contraction of the body segments. The younger larvae are ovoid in outline and are too small to fill the tunnel. In this stage, therefore, they move by adhesion to the tunnel walls. The question of the number of instars or stages of larval development is controversial, Gadd [48] and Smith [99] claiming three and Hogan [60] five. Very little taxonomic work has been done on the larvae except for two valuable papers by Gardner [50, 51]. There are two main groups of larvae: those reared free in a common tunnel or chamber and those found in larval cradles. The former are less curved and more elongate than the latter and have mouth parts that are not adapted for chewing wood. Leach, Hodson, *et al.* [73] state that the larvae found in cradles have strong mandibles and head muscles adapted for the chewing of wood whilst enlarging their cradles. The length of the larval stage varies from as little as 9 days to several months, as some species may pass the winter in this stage. This variation is largely due to climatic differences but is also determined to some extent by the condition of the host material.

Pupa. For one or two days prior to pupation the larvae become quiescent. Those living free in the parent tunnel are frequently found lying on their backs during this pre-pupal period. The pupae are white and somewhat shorter than the larvae from which they develop, and are of the exarate type common to most Coleoptera, i.e. the appendages are free. They are immobile except for the abdomen which wriggles actively if the pupa is disturbed. The time spent in the pupal stage varies from as little as 3 days to 14 days generally. In temperate climates there are recorded cases of over-wintering pupae.

Adult. The beetles range in size from 0·8 to 9·0 mm. in length, are cylindrical in shape with a maximum body diameter of 0·3 to 2·5 mm., and are black or a dark reddish-brown. Within the above limits they exhibit a great deal of variety in shape, elytral sculpturing and general morphology, both

between genera and species and between sexes within a species. The differences in secondary sexual characters are related to a division of labour between the sexes. For example, in several genera the principal function of the male is the removal of frass from the tunnels and the protection of the tunnel. The posterior ends of the elytra are impressed and truncated and thus variously modified to act as a very efficient shovel and scraper, as well as being suitable armour to block the entrance of the tunnel to predators. In other genera, e.g. *Xyleborus*, the males are degenerate, small, blind and incapable of flight.

Upon emerging from the pupal cases, the beetles are pale yellow with dark patches marking the eyes and mouth parts. In a short time they turn to the dark brown or black of the mature adults. The total length of time spent in the adult stage consists of three phases: the time spent as young adults feeding and maturing in the parent tunnel, the time spent in the open whilst flying to a new host, and the time spent preparing a new tunnel and tending the new brood. Each of these three phases is very variable in length and thus the total period of adult life may be completed in a few days or may last over two years. In the tropics many species breed continuously throughout the year, whilst in the temperate regions of the world a single generation each year is more usual.

Life History and Habits

The study of the biology of an insect group which spends so much of its life hidden from view is difficult, and a great deal of what has been written is based on surmise or inferential reasoning. As Beeson [10] very aptly says, "Very little is known of what takes place inside the dark, moist depths of the platypodid underworld." Again, as with the morphology and the duration of the life stages, much variation exists, related to species, genera and external factors.

Ambrosia beetles attack a very wide range of host material. Felt [41] reports *Xylosandrus germanus* (Blandf.) as a pest of grape vines in America. Cleare [34] gives an account of damage caused to rum puncheons in British Guiana by *Xyleborus badius*. In Ceylon one of the major pests of the country is *Xyleborus fornicatus* Eichh., which does serious damage to living tea plants. Several species of the beetles are polyphagous in habit, whereas others are more or less oligophagous. This paper, however, is concerned with the attack on the usual class of host, which is timber. Hardwoods are most frequently attacked but the damage to softwoods can, nevertheless, be serious. By far the greater part of the damage occurs in green logs, which are sometimes subject to attack almost immediately after a tree is felled and remain susceptible so long as the moisture content is suitable. Some attack, however, is sustained by standing trees as noted by Browne [15, 16] and Fisher [43], and some species are recorded by Schmidberger [93], Mathers [78] and others as doing considerable damage to living fruit trees. Sawn timber in green condition is also subject to attack. The biology as discussed here, however, is mainly as exemplified by beetles infesting logs.

The life cycle of ambrosia beetles is generally considered to begin with the emergence of the young adults from the parent tunnel. In genera in which the male is degenerate, it is presumed that the females are fertilized in the old brood burrows prior to leaving them to form new burrows elsewhere. It has been postulated, however, by Beal and Massey [8] that the male in these genera serves no function whatever and that the females are parthenogenetic. In such cases, the female starts and develops the new burrow by herself and the females greatly outnumber the males. In other genera, the male usually commences the new tunnel and is later joined by a female; the ratio of the sexes is approximately equal and monogamy is the rule. In some species of *Platypus* there are more males than females and polyandry occurs, the males engaging in fierce combat with one another over the possession of the female. When the male commences a new tunnel, the female apparently locates the male by some attractant, probably chemotropic, as she moves from tunnel to tunnel. When she discovers a tunnel occupied by an unaccompanied male she entices him from the newly commenced tunnel and then precedes him back into it. According to Hogan [60] copulation occasionally occurs at the entrance but more frequently is surmised to occur within the tunnel. It is difficult to understand how mating can occur within the tunnels as they are just large enough in diameter to permit the beetles to move about and there are no special niches provided for turning or for 'nuptial' chambers as is the case with the allied barkbeetles.

The date of flight varies greatly with different species and with climate, and the time of flight also varies considerably within a day. Hogan [60] states that with *Platypus subgranosus* Schedl in Australia, flights did not occur on wet or cold days and that the males emerged late in the afternoon and the females the following morning. Beetles of *Diapus furtivus* Samp. fly during the day in full sunshine [9], and in the Platypodidae the general rule is for the males to swarm first, followed by the females later on the same day or on the first or second day following [13]. The flight is feeble, as the wings are flimsy and somewhat hindered by the wing covers, which are held erect during flight. The period spent

in flight, during which the beetle is out in the open for the only time during its life, is normally very short—a few hours to 2 or 3 days. In the genus *Trypodendron*, which is widespread and economically important throughout the north-temperate regions, the period spent outside the tunnels is much longer. For many years it was not known where the beetles of this genus passed the winter. Hadorn [56], however, proved that the main European species, *Trypodendron lineatum*, hibernates in the top layers of the forest litter, mainly in an area from 6 to 18 metres from the base of the tree or log in which it was bred. Thus, in this genus, the period spent outside the tunnel lasts for several months.

When the flight terminates at a new log the beetles start boring almost at once. Some species seem able to obtain a purchase to start boring on even the smoothest surface, while others appear to prefer freshly cut or broken surfaces or a bark crevice.

The boring starts with an entrance tunnel that passes directly through the bark, if present, and then more or less directly into the sapwood, or in some cases into the heartwood. These tunnels are perfectly cylindrical owing to the shape of the beetle and its habit of revolving while cutting them. They are small, ranging in diameter from slightly less than 0·5 to over 2·5 mm. depending on the size of the beetles, and they vary greatly in length from a few inches to several feet. Since the insects do not feed primarily on the wood, the borings are cast out of the tunnels in the form of a very fine, light-coloured powder. This is often copious and collects in the bark crevices, at the base of the tree or log, or on the surface or beneath infested lumber, and is conspicuous evidence of the presence of the beetles. In some cases, the extruded material consisting of bore dust and excrement projects from the entrance hole for several centimetres as a cylindrical rod of the same diameter as the entrance hole. In the genus *Trypodendron* the opening to the tunnel is covered by a cup-like layer, an aggregation of excrement. Through a small hole in the centre of this cup, which is outwardly convex, a slender thread of bore dust projects, pushed out gradually by additions from within, until broken by rain or gravity. In *Diapus furtivus* Samp., studied in detail by Beeson [9], a tube constructed of wax secreted specially for the purpose projects from the mouth of the tunnel beyond the surface of the bark or wood. The entrance tunnels progress more or less straight into the wood in a radial direction, at a rate varying with the species of insect and the host material.

Once within the sapwood, or in some cases the heartwood, at a depth which differs with species, the entrance tunnels are elaborated into egg tunnels or cavities in a variety of ways. These tunnel patterns are often typical of a species or genus and are described in some detail by several writers. Here, it will suffice to state that there are two main types; those in which the eggs are deposited in niches, and those in which the eggs are deposited free in the tunnels. The first type are referred to as compound tunnels, and the second type are termed simple tunnels.

In the compound tunnels, the entrance tunnel branches into an indefinite number of side or egg tunnels which extend in any direction from the entrance tunnel, and to some extent their course is a specific character. Some penetrate further into the log radially; others turn and follow a circumferential course, more or less along an annual growth ring. In some species the turn at the end of the entrance tunnel is consistently to the right, and in others, to the left. The tunnels are most often in a horizontal* plane although some genera have tunnel elaborations in a vertical* plane. The female then cuts small, closely spaced niches in the top and bottom of the egg tunnel. These niches also frequently follow a definite pattern, sometimes alternating from top to bottom along the tunnel and sometimes being opposite each other on top and bottom. In all cases, however, they run parallel to the grain of the wood and are cup-shaped and somewhat deeper than the thickness of the eggs. The eggs are then deposited, one to a niche, and loosely packed with boring chips and fungus taken by the female from the fungal bed that she has prepared in the vicinity and upon which the spores of the fungus, carried in accidentally or intentionally by the beetles, have started to grow. The young larva, as soon as it hatches from the egg, eats the fungus from amongst these chips. As the larva grows it deepens the egg niche into a cradle which attains a length of about 5 mm., dependent on the species, by the time the larva reaches maturity. The cradle is slightly larger and longer than the larva, which may turn therein but is usually found facing away from the main gallery. Hubbard [65] states that the larvae ingest, but do not digest the wood which they excavate, passing it through the intestine unchanged in cellular structure and texture. It is cemented by the excrement into pellets which are stained yellowish in colour. These pellets are not allowed to accumulate in the cradle but are pushed out by the larva into the main tunnel, from which they are removed by the adults: some pellets are ejected from the boring and others are used to form a bed for the fungus. During this period of development the female beetle is in constant attendance upon the growing larvae. The mouth of each cradle is closed with a plug of the fungus and as soon as this is consumed it is renewed with fresh material. The plug is from

* The terms 'horizontal' and 'vertical' as used here should be taken to mean respectively at right angles to and parallel with the axis of the tree, and may thus be applied equally to a standing tree or a recumbent log.

time to time perforated by the larva for the purpose of ejecting the frass from its cradle. After completing their development, and prior to pupation, the larvae reverse their position and face the main tunnel. They transform to pupae and then to immature adults while still in the cradles, where they remain for a variable length of time until shortly before they emerge to attack a new host.

In the second main group, with the simple type of tunnel, the tunnels branch out from the entrance tunnel in a vertical or horizontal plane or as an enlarged cavity or cave. In this simple type, the eggs are deposited free in the tunnels or cavity, and the larvae live therein without cutting cradles. As in the compound type, excrement and borings are ejected from the tunnel through the entrance tunnel, a small portion being retained to act as a bed for the new crops of fungus. In the cave type of tunnel, Hopkins [62] found pupae without abdomens and suggested that at this helpless stage they are eaten by the larvae and adults if the ambrosia fungus is scarce or the brood chambers are overcrowded.

Some genera exhibit habits intermediate between those of the simple and compound types described above. The eggs are deposited free in the tunnels, but just before pupation the larvae cut cradles in which they pupate and transform to adults.

These young adults feed on the ambrosia fungus in the parent tunnel. If conditions are optimum they may be ready to emerge to attack a new host within a few days or, alternatively, they may pass the winter in this stage. The adults emerge through the original entrance hole and do not construct a new exit. Thus there is only one hole to the outside of the log for each brood throughout the entire life-cycle. On completing their development the beetles of a new generation escape, some species returning to the same log, attacking it again and again for several generations as it gradually dries out, others infesting only freshly cut timber, leaving it after a single generation [15].

The Ambrosia Fungi

Despite the fact that the association of these beetles with a food material in their tunnels has been known since 1836, when Schmidberger [93] called it 'ambrosia', and that Hartig [57] in 1844 had recognized its true fungal nature, the fungi concerned have received relatively little attention from systematic mycologists. To quote Leach [72], 'taxonomic studies of ambrosia fungi are conspicuous by their absence'. There is, in addition, a great deal of disagreement among workers on the problem. Some claim that each species of ambrosia beetle is associated with its own particular species of fungus [6, 38, 107]. Others claim that limited taxonomic groups of the beetles are associated with one species of fungus [73], and still other workers claim that the species of fungus are specific to the host plant and not to the beetles. A recent comprehensive work by Webb [110] in Australia claims that all ambrosia fungi belong to the genus *Leptographium* and perhaps to one species. The question that arises is whether the fungi are at all specific, and if so, whether to each beetle species, to groupings of the beetles, or to the host plant. Graham [55] is of the opinion that the specificity of the beetles for certain trees is the direct result of the specific requirements of their particular fungus. Hubbard [65] states that there are two distinct types of fungi found in ambrosia beetle tunnels: (*a*) those with erect stems and terminal conidia, and (*b*) those with cells in a tangled, bead-like chain. He claims that the erect form is found in association only with the species whose larvae live free in the adult tunnels, and that the bead-like form occurs only in the tunnels of those beetles whose larvae are reared in cradles.

The fungal spores get carried into the tunnel by the parent beetles when they first attack and, in contact with the specially prepared beds, develop rapidly, starting to grow immediately if the moisture content of the wood and the temperature are suitable. The resulting mycelium becomes visible a few days after the tunnel excavation begins; the hyphae penetrate the cut cells of the wood and spread from 1 to 8 mm. [107], and probably are the cause of the dark brown or black stain which usually characterizes ambrosia-beetle tunnels. This stain varies in intensity of colour and extent according to the host, to the species of beetle and fungus, and with the conditions of growth for the fungus. The cell walls of the wood surrounding the holes appear to be intact, so that the timber is not weakened structurally to any material extent. The conidiophores of the fungus project into the beetle tunnel and appear as a dense covering of the walls, somewhat like the pile on velvet. These conidiophores are white, translucent and succulent, and it is in this stage that they are eaten by the beetles. If the conidiophores are cut, they soon spring up afresh. Hubbard [65] has likened the fungi to asparagus, which remains succulent and edible only when continually cropped, and if allowed to go to seed is no longer useful as a food.

Ambrosia fungi have been isolated and cultured on artificial media, but a number of other fungi, bacteria and yeasts are frequently found in association with them. According to Leach, Hodson, *et al.* [73] these other contaminants are kept suppressed by the beetles in a manner that is not known; but Webb [110] is of the opinion that the yeasts serve somewhat as a fertilizer and cause a more luxuriant growth of the ambrosia fungi.

Interrelationship of Beetles and Fungi

The beetles and the fungi have been discussed as more or less separate entities and it now remains to examine more closely their interrelationship. In discussing the social aspects of the habits of ambrosia beetles, their apparent cultivation of food has led many observers to ascribe a high degree of intelligence to these insects. It is more probably a remarkable example of ectosymbiosis between the beetles and the fungi whereby the insects depend upon the fungus for food and the fungus depends upon the insects for transport to a new host. Bakshi [6] points out that ambrosia fungi can also occur in nature independently of any association with ambrosia beetles.

The method of transporting the fungal spores by the beetles is not definitely known and is explained in a variety of ways. Chamberlin [31] lists the following methods:—

(1) Voided by the beetles in their excreta [83, 84, 85, 86, 87].

(2) Carried in the crop of the female and regurgitated when the beds have been prepared [94, 95].

(3) Carried in the brush of hairs that occurs on the front of the head of many species [101].

(4) Carried under the elytra.

(5) Carried in special pores: Beeson [9] reports that in some species there are large pores on the prothorax and head which contain globules of fat to which the spores readily adhere.

(6) Carried by adhering to hairs on the ventral surface of the abdomen.

Whether the transport of the spores is accidental or intentional, there can be little doubt that the beetles exhibit definite 'intent' in the cultivation of the fungus. The fungus 'gardens' are definitely under the control of the female beetle and are started upon a carefully prepared bed or layer of chips, sometimes near the entrance, sometimes near the end of a branch tunnel, or sometimes in special brood chambers. In no case is the fungus allowed to occur at random throughout the tunnel, and all foreign fungi, yeasts and bacteria are suppressed in a manner that is not known. The excrement of the larvae is used in many cases to form new beds and probably acts as a more fertile substratum for the fungi than the chips or wood alone. The fungus is kept in a tender, succulent condition by constant cropping and is not allowed to ripen. If it does so the new spores germinate rapidly and the beetles are apt to suffocate in an overproduction of their own food.

The exact part that the fungus plays in the insect diet is not known. Some authors [65] state that the beetles subsist solely on the fungus and that if any wood is ingested, it is excreted without being digested. Brues [29] states that the fungus serves as a source of nitrogenous material supplementing the wood diet, especially of larvae living in separate cradles. The fact that the insects, adults and larvae, can subsist and develop on artificial cultures of the fungus would lead one to believe that the fungus is the major, if not the only food of these insects.

Factors Affecting Attack

The extent of injury caused by any insect is probably controlled more by the amount of suitable food available to it than by any other single factor. One would think that ambrosia beetles which transport and cultivate their own food would not be affected by this factor. Nevertheless, the numbers of ambrosia beetles are limited by the abundance and distribution of host material that is suitable for the development of the ambrosia fungi [55]. Different tree species exhibit different degrees of susceptibility to attack by different species of ambrosia beetles and the specificity of the beetles for certain trees may be a direct reflection of the specific requirements of their particular fungus.

In addition to species of host, the condition of the host material has an important bearing on the degree of attack. An adequate moisture content of the wood, i.e., sufficient moisture for the growth of the fungus, is probably the main condition that has to be met before ambrosia beetles will attack; if they do so, they will leave or perish as soon as it is insufficient to support the fungus. Most authors state that the beetles will not attack if the moisture content of the wood is below 50%. Christian [33] sets the figure more exactly at 48% in timbers in the southern U.S.A. Thomas and Browne [105] indicate that in Malaya, timber after conversion ceases to be attractive to the beetles when the moisture content falls below 40%, and state that at moisture contents down to about 20% insects already present may survive but cannot spread and will eventually die out.

The above facts explain why ambrosia beetles will not attack seasoned lumber and dry logs, but do not explain why most of the beetles will not attack living trees which have a moisture content well above 50%. Doane, van Dyke, *et al.* [39] suggest that the sap must be in a fermenting condition before the beetles will attack. The beetles, however, may be found boring into the wood within a few hours after the tree is felled: very little fermentation, if any, could have taken place in such a short time. A more

probable explanation is that in normal healthy trees the moisture content is too high or that the movement of the moisture interferes with the growing of the fungus.

Other factors affecting ambrosia-beetle injury are closely allied to the moisture-content requirements. For example, it has been observed [111] that in large piles of logs, attack is heaviest on the under-sides of the logs or at the bottom of the pile where there is little sunlight, and this is probably due to the slower drying in the shade. Again, the extent of attack by some species is closely associated with the width of the sapwood [52], and is also affected by the retention or removal and the character of the bark [25, 75].

Temperature is also a factor influencing ambrosia-beetle injury, not only through limiting the distribution of host and insect climatically but possibly as it affects the growth of the fungus. In laboratory cultures of an ambrosia fungus, Gadd and Loos [49] found that the temperature had a direct bearing on its rate of growth. If this is true under natural conditions also, temperature may be a very definite limiting factor in ambrosia-beetle attack.

Where ambrosia beetles attack living trees, the factors affecting the degree of attack are somewhat different. Moisture content in this case is not the predominating factor but only one of a multitude that go to make up the environment of the beetles and fungi. Very little has been done in determining the relationship of site factors to ambrosia-beetle attack. Beal and Massey [8] state that the damage caused by *Corthylus punctatissimus* Zimm. to cultivated shrubs is most severe among plants that have been heavily mulched. Infestation of standing trees has usually been regarded as an indication of their poor vitality, a sickly or dying condition. There is, however, growing evidence that attack in trees that show no external sign of abnormality may be much more frequent than hitherto supposed. Browne[16] records that the Platypodid, *Crossotarsus impar* Schedl, one of the most important insects of Malayan forests, attacks apparently healthy trees as readily as sickly ones. There are also indications from observations in the Gold Coast [106], from records of attack in virgin tropical forests in Malaya [22] and also in timber from temperate climates [43], that attack may follow a temporary reduction in vitality of a tree as a result of some passing condition unfavourable for its normal growth, and cease when these conditions no longer exist. Evidence of such infestation remains permanently in the timber in the form of typical pinholes apparent only after felling and conversion. The conditions governing incidence of attack both in logs and living trees are, however, not yet fully understood and there is much truth in Browne's comment [12] that 'We are still groping about in a dismal abyss of ignorance'.

Economic Importance

Nature of Damage

In general, ambrosia beetles are not primarily responsible for the death of trees, and even in the tropics cannot be considered as major forest pests, although an ever-present nuisance [20]. Their economic importance lies chiefly in the degrade of sawn timber caused by their activities in trees or logs, and resulting in the presence of tunnels which in some cases are confined to sapwood but in others penetrate deeply into the heartwood. Unless very numerous and concentrated within restricted areas, these tunnels have little effect on mechanical strength, but they are often darkly stained or associated with patches or streaks of discoloured wood in their immediate vicinity. Of uniform size, ranging from less than 1 mm. to slightly over 2·5 m. in diameter, according to the beetle responsible, the tunnels are free from bore dust and can thus readily be distinguished from the workings of other wood-borers, e.g. powder-post beetles of the families Bostrychidae and Lyctidae whose larvae fill their tunnels with frass and reduce the infested sapwood to a fine, flour-like powder.

It is important to repeat that ambrosia beetles will not attack seasoned timber, and that when the type of defect caused by these insects is present in converted, seasoned stock there is no danger of increase or spread of infestation. Occasionally, ambrosia beetles attack forest products in use, such as liquor casks [34, and Blandford quoted in 27] and it has been suggested that they are attracted by the fermentation of the contents.

There is some evidence [von Schrenk 1903, quoted in 8; 10] that ambrosia beetles are important as disseminators of wood-staining fungi, the spores of which are carried on the bodies of the beetles, and in some timbers may result in defects more serious than the damage caused by the insects. Whilst it is usually possible to control staining fungi by superficial spray or dip treatments with fungicides, these are of little use for preventing the development of stain carried deeply into unseasoned timber by the beetles in the excavation of their tunnels. Browne [20] states that there is no direct evidence of ambrosia beetles acting as vectors of disease in forests, but quotes Sharples [97] as of the opinion that *Xyleborus parvulus* Eichh. is responsible for spread of disease in rubber plantations, and comments that the insects probably play a greater part in carrying fungi than has been supposed. This view is supported by Buchanan's findings [30] in which it has been shown that in the U.S.A. the Dutch Elm disease

Ceratostomella ulmi (Buism.), is transmitted by *Xylosandrus germanus* (Blandf.) although it is not one of the major vectors.

Assessment of Losses

The presence of even a few 'wormholes' caused by ambrosia beetles restricts the use of affected timber to purposes or positions in which such defects are not considered unsightly. Timbers otherwise suitable for veneers may be rendered valueless for the purpose and fit only for core stock. Considerable losses may result from the refusal of manufacturers or building contractors to accept timber showing this type of damage, because of confusion with and fear of continued trouble as experienced with other wood-boring insects which do affect seasoned timber. The marketing and uses of several of the lesser known 'soft' hardwoods from tropical regions of the world have suffered seriously in this respect because of their susceptibility in the country of origin to severe infestation by ambrosia beetles [75].

The damage has long been accepted in most timber-supplying countries, especially in the tropics, as a defect which in certain susceptible timbers is unavoidable, and local markets have been found without difficulty or serious financial loss. In the export trade, however, the situation is different and has led exporters, shippers and importers to view with increasing concern the extensive losses that result from the prevalence of this type of damage, which in commercial timber-grading rules is regarded as a standard defect. Australian quarantine regulations prohibiting the importation of logs or lumber containing living insects have had far-reaching repercussions and have led to investigations in different parts of the world, amongst the first being an enquiry by Schultze in 1923 [96] concerning infestation in Philippine timbers reaching Australian ports. Graham and Boyes [52] give an historical account of the problem in British Columbia and of developments since 1928 arising out of infestation or damage in shipments of Hemlock and Douglas Fir reaching Australian ports, whilst Smith [98, 99] deals with the matter from the point of view of damage in Queensland timbers for export to Canada. Little published information is available from the British Colonies, but Browne [21], Fisher [42] and Fisher and Thompson [45] summarize existing information. Within recent years, attention has been given by Belgian [108, 79] and French [4, 90] authorities to the damage caused by ambrosia beetles in their West African territories.

Precise figures on the extent of damage and financial loss caused by the activities of these insects are not available, but estimates have been made from time to time. According to Mesa [80] in 1929 about 25% of Philippine timber shipped to foreign countries was graded as wormy and sold at a loss of $2,600,000 on the year's export of approximately 104,000,000 bd. ft. In the same year Strohmeyer [102] estimated that 40–50% of veneers cut from 'soft' hardwoods imported to Hamburg from West Africa were sometimes rendered unusable. In British Columbia the presence of pinholes may reduce the market value of the better classes of timber by as much as 50% [52]; whilst in North America in general it has been stated [31] that the losses amount to several million dollars annually, including not only considerable quantities of forest products but also loss of time and labour during manufacturing processes. Keen [68] puts the figure at 0·5–5·0% of the total value of various classes of forest products.

Comparative estimates for tropical hardwoods coming on to the market at the present day from different parts of the world are not available.

The importance of accurate assessment of losses in relation to the economics of control measures is discussed by Prebble [88] and has led to a series of investigations in British Columbia with two species of ambrosia beetle affecting Western Hemlock and Douglas Fir. The results of this study [52, 74, 54], made possible by the co-operation of forest entomologists, Forest Products Research Laboratory staff, and commercial sawmills, although as yet incomplete and applicable only to specific Canadian conditions, are of general interest. In summarizing the results so far obtained, Graham and Boyes [52] conclude that 'this problem is more complex to appraise from an economic point of view than is at first apparent'. Although reduction in value of timber through degrade is the most important loss, the effect of increased slabbing and edging waste on mill output has to be taken into consideration. Furthermore, there is the effect of increased manufacturing time when the sawyer attempts to obtain a clean face on a log before passing it on to the edger. The extent of these different types of losses is not at present known with any accuracy and is rarely appreciated except by mill owners 'looking critically at a situation with which they are perpetually confronted'.

An important new development in this work is an attempt to establish for a single borer species a 'damage index' by correlating the numbers of holes on the surface of logs with the numbers found in the lumber after conversion [53]. It has been found, for instance, that in Western Hemlock for every hole per sq. ft. of log surface there are on the average 240 holes per 1000 linear ft. of edge grain, equivalent to 1 to every 4 linear ft. Such a means of estimating the possible degrade before conversion of a log is

obviously of great value but depends on an accurate knowledge of the biology and tunnel pattern of the insect concerned. It is not at present generally applicable but well deserves examination with other timbers and insects in other parts of the world. The Canadian investigation dealt with a single species, and complications would inevitably arise in tropical timbers where several species of different habit are involved.

Attempts, by various means, to prevent or at least reduce the widespread damage caused by ambrosia beetles, have long been made in many parts of the world with varying degrees of success. A review of this work and an outline of future developments, together with a list of selected references dealing with ambrosia-beetle problems as a whole, will constitute Part II of this article.

Part II and bibliography will appear in the next number.

ABSTRACT SECTION

0. FORESTS, FORESTRY, AND THE UTILIZATION OF FOREST PRODUCTS: GENERAL

For general *regional* accounts see section 90

0 (02). HANDBOOKS. MANUALS. TEXTBOOKS

2960. PERRIN, H. Sylviculture. Tome premier: Bases scientifiques de la sylviculture. [**Forestry. Vol. 1. Scientific bases of forestry.**] École Nationale des Eaux et Forêts, Nancy. 1952. pp. xxii + 318 + 40 photos. 334 + 84 refs. Price [£1. 4*s.* 6*d.*]

Part 1, Forest Ecology, consists of 3 chapters on forest vegetation and climatic, edaphic, and biotic factors respectively. Part 2, Forest Stands, has 4 chapters on composition, cultural forms, development and structure, and density, of stands. Part 3 deals with the theory of management and the relation between silviculture and management. Part 4 describes the forest regions of France in detail.

2961. EMBUN Y GONZALEZ-ARNAO, J. X. DE. Los montes—introducción a la selvicultura. [**Forests —an introduction to forestry.**] *Manuales Técnicos, Ministerio de Agricultura, Servicio de Capacitación y Propaganda, Madrid* (*Ser.E*) No. 14, 1951. pp. 367 + 2 maps + 5 tbls. + 5 gphs. Numerous refs. [Span.]

A handbook covering all the main aspects of forestry under the following heads: the stand, its characteristics and those of the tree, the composition of different types of stand at different stages of their development, distribution of forest types in Spain; general information on forest species suitable for Spain; mensuration; management and silvicultural systems; grazing and the forests; forest nurseries; artificial regeneration with special reference to species and methods suitable for Spain; hydrology, watershed management and soil fixation; aesthetic considerations; game and fish management; forest protection; exploitation; organization and legislation.

0 (048.1). BIBLIOGRAPHICAL LISTS

See Nos. 3735, 4032.

0 (052/054) PERIODICALS

2962. ***Food and Agricultural Legislation.*** FAO, Rome. Quarterly. Price per vol. (4 nos.) 25*s.* or $5·00; per single copy 7*s.* 6*d.* or $1·50.

This publication, to appear in 3 editions (English, French and Spanish), takes the place of the former International Yearbook of Agricultural Legislation. Texts of legislation are, according to their special interest, reproduced in full or summarized. They are issued in separate leaflets in one folder. Abbreviation in *For. Abstr.: Food agric. Leg.*

2963. ***The Ceylon Forester* (*n.s.*)** Forest Department, Ceylon. Half-yearly. Price *Rs.*1·50 p.a.; single copies *Rs.*1·00.

A revival of *The Ceylon Forester* 1895–98. Vol. 1, No. 1 of the new journal, published January 1953, contains 50 pages. Citation in *For. Abstr: Ceylon Forester* (*n.s.*).

2964. ***Vanasarn* [*Journal of Forestry*].** Royal Forest Department, Bangkok. Quarterly. Price 10 *baht* p.a.

Vol. 10, No. 1, issued in January 1952, contains 63 pages. The contents list and occasional articles and summaries are in English. Citation in *For. Abstr: Vanasarn.*

2965. ***Canadian Journal of Agricultural Science.*** Agricultural Institute of Canada, 338 Somerset Street West, Ottawa. Monthly. Price $3·00 p.a., single copies 50*c.*

Previously *Scientific Agriculture.* The new title begins with Vol. 33, No. 1, January–February 1953. Abbreviation in *For. Abstr.: Canad. J. agric. Sci.*

2966. ***Australian Journal of Scientific Research.*** Commonwealth Scientific and Industrial Research Organization, 314 Albert Street, East Melbourne, C.2. P.R.

As from 1 Jan. 1953, Series A: *Physical Sciences* is split into two journals under the titles *Australian Journal of Chemistry* and *Australian Journal of Physics*; and *Series B: Biological Sciences* becomes the *Australian Journal of Biological Sciences.* The volume numbers of the earlier publications are continued in the new journals. Each is issued quarterly, price 30*s.* p.a. Abbreviations in *For. Abstr.: Aust J. Chem.*, *Aust. J. Phys.*, and *Aust. J. biol. Sci.*

0 (084.3/4). MAPS AND ATLASES

See also Nos. 2977, 2989, 2991, 3022, 3146, 4028, 4033.

2967. Weltforstatlas. [**World forestry atlas [part].**] Fritz Haller Verlag, Berlin-Grünewald. 1951–52. 16 folded sheets. [G.E.F.Span.] [Bundesanstalt für Forst- und Holzwirtschaft, Hamburg-Reinbek.] Subscription price *DM.*10 per sheet.

When complete, this atlas is intended to contain, in a looseleaf binder, about 50 sheets of maps and 30 sheets of statistical matter and text. Sixteen sheets of maps have so far been published, as follows:— Northern Eurasia (forest distribution); Europe (forest distribution, wood production and wood products by categories, import and export of wood and wood products); Italy (forest distribution, species distribution, forest areas showing types of forest, percentage felled by assortments, annual cut); Great Britain, France, Germany, Turkey and Greece, Hungary and Bulgaria, Jugoslavia, Finland, Norway and Sweden (forest distribution); New Zealand (vegetation).

2968. Steirischer Waldatlas. **[Forest atlas for Styria.]** Landeskammer für Land- und Forstwirtschaft, Graz. 1950. pp. [81]. [G.]

Contains 46 maps and diagrams with tabulated data showing: topography, geology and soil types; climate; land use; forest areas; species distribution; plant associations; increment; felling and utilization figures; insect damage; and game and hunting.

0 - - 011. TERMINOLOGY. NOMENCLATURE

See Nos. 3081–4, 3702.

0 - - 015. MATHEMATICS. STATISTICAL METHODS

See also No. 3347.

2969. FINNEY, D. J. **Introduction to statistical science in agriculture.** Oliver & Boyd, Edinburgh. 1953. pp. 179. Price 25*s*.

2970. PEARCE, S. C. **Field experimentation with fruit trees and other perennial plants.** *Tech. Commun. Bur. Hort. Plantat. Crops, E. Malling* No. 23, 1953. pp. 131. 194 refs. Price 10*s*. or $1·40.

Statistical method in relation to experimentation with perennial plants, based both on literature and on experience at East Malling. Both design of experiments and analysis of data are covered.

0 - - 087. APPARATUS, INSTRUMENTS, MACHINERY: GENERAL

2971. **Equipment news.** *Unasylva* 7 (1), 1953 (40–2).

Descriptive notes with illustrations of the following amongst others: Aluminium chute constructed under the directions of the Forestry Commission [cf. *For. Abstr.* 13 (No. 1270)] (A.P. Metalcraft Ltd., Coventry, England); One-man circular saw for use in the forest (Barker Saw Co., Springfield, Missouri); Eagle pole trailer designed to carry English timber (Eagle Engineering Co. Ltd., Warwick, England); 'Sabre' scrub-clearing machine (J. Foster & Co. Ltd., Brough, Yorks.); Automatic air tongs (Berger Engineering Co., Seattle, Washington, U.S.A.); All-steel hydraulic log and lumber cart (Barstarke Equipment Co., Richmond, Va.); Electric, transportable sawbench PPK 200 (Établissements P.P.K., Courbevoie, Seine, France).

1. FACTORS OF THE ENVIRONMENT. BIOLOGY

11. SITE FACTORS: CLIMATE, SITUATION, SOIL, HYDROLOGY (WATER AND SOIL CONSERVATION)

See also Nos. 4017–8.

111. *The Atmosphere. Meteorology. Climate and Microclimate*

111.2. Radiation and Temperature

See also No. 3177.

2972. ROUSSEL, L. La lumière et la forêt. **[Light and the forest.]** *Rev. for. franç.* 5 (4), 1953 (273–90 + 5 photos). [F.]

The substance of a degree thesis embodying the results of the author's researches on the effects of relative illumination in the forest. [Cf. *For. Abstr.* 12 (No. 958); 13 (No. 3558)].

111.7. Humidity, Evaporation, Precipitation

2973. MASSON, H. Condensations atmosphériques non enregistrables au pluviomètre. L'eau de condensation et la végétation. **[Atmospheric condensation not measurable in a rain-gauge. Condensation water and vegetation.]** *Bulletin de l'Institut Français d'Afrique Noire, Dakar* 10, 1948 [1951?] (1–181 + 6 photos). 85 refs. [F.f.]

In three parts: Part 1 deals with dew (general considerations; methods of measuring; measurements made in W. Africa; factors in formation; time and appearance of formation; depth to which dew penetrates; dew and fog). Part 2 deals with occult precipitation, its nature and importance. Part 3 deals with the influence of dewfall and occult precipitation on vegetation. The author's measurements indicated that in West African conditions the amount of moisture acquired from dew by a sandy soil was very small (0·3% of soil weight, whereas m.c. of soil at wilting point is more than 2%). Experiments to discover whether leaves can absorb dew directly, gave indeterminate results.

111.8. Climatology. Climate and Microclimate

See also Nos. 2979, 3147–9, 3194, 3253–4, 3262.

2974. IABLOKOFF, A. KH. Le rôle hygrométrique des arbres morts dans l'équilibre thermodynamique des forêts. **[The hygrometric rôle of dead trees in the thermodynamic equilibrium of forests.]** *Rev. for. franç.* 5 (1), 1953 (17–28). [F.]

The author describes and discusses his study of the moisture regime in dead standing and fallen trees and its effect on the microclimate in the neighbourhood of the tree. He estimates that a standing tree that has been dead for 2–3 years and is therefore relatively dry, will produce a 'sleeve' of humid air extending to a distance of 200 mm. and with a hygrometric gradient varying from saturation at the surface of the trunk to the current mean atmospheric humidity on the periphery of the 'sleeve'. This 'sleeve' of humid air will be constantly moved by a vertical current (almost always descending) which will keep it cool as well as moist, thus providing an exceptionally favourable environment for young reproduction. Fallen trees give rise to similar phenomena, but of course with the difference that the hygrometric gradient progresses in a vertical,

not a horizontal, plane. The argument is illustrated by data obtained from measurements on and round a dead Beech in the forest of Fontainebleau. The author also discusses, without experimental data, the possible effect of a dead tree on electrical conditions in the atmosphere. [Cf. *For. Abstr.* 12 (Nos. 65, 2857).]

2975. Tomanek, J. Wpływ ściany drzewostanu na mikroklimat poręby. [**Effect of the forest margin on the microclimate of a clearing.**] *Prace Inst. Bad. Leśn.* No. 87, 1952. pp. 52 + 8 tbls. 31 refs. [Pol.pol.russ.e.] Price *Zł*.8·50.

Presents tabulated and graphed results of measurements made from 1929 to 1935 on a clearing in the Rogów experimental forest. The site was a regular octagon (radius of inscribed circle 96·5 m., total area 3·09 ha.), the eight sides facing the main points of the compass. The stand consisted of Pine (naturally regenerated), ca. 60–70 years old, average height 22–23 m., site quality I (Schwappach), stand density 0·7, with small admixtures of Spruce and Oak, and a Hornbeam understorey. Air temperature and humidity, soil temperature and moisture content, rainfall, and days with late frosts were determined or noted at 5 points in the clearing, viz. in the centre and at 5 m. distance from the centre of each side facing the main points of the compass. The highest average diurnal and annual temperatures were observed on the N. side followed by W., E., and S. The amplitudes of the average, and of the absolute extreme, annual temperatures were greatest on E. and W., followed by N. and S. The centre of the clearing was warmer than the S. side, but colder than the other sides. The variations of humidity were opposite in sign to those of temperature. The time lag in attaining the maximum soil temperature was the same at all points of the clearing. Unlike the air, the soil was warmer at the E. than at the W. side. In the centre, the soil was colder than the soil on the N., but warmer than on all other sides. The spring thaw begins on the N., followed by E., W., and S. Monthly and annual amounts of precipitation revealed no consistent trends; monthly and annual averages over a period of years, however, did so. The amount of rainfall decreases in the sequence: S., W., centre, E. and N. The centre gets slightly more than land outside the forest.

2976. Koelmeyer, K. O. **A climatological basis for the introduction of exotic forest tree species into Ceylon.** *Docum. FAO Asia-Pacif. For. Comm. 1952* No. 45, 1952. pp. 13. 16 refs. Limited distribution: FAO, Rome.

Discusses the use of homoclimes in choosing exotic spp. for introduction, and particularly the application of Köppen's, Thornthwaite's and Swain's systems of climatic classification to the climatic zones of Ceylon.

2977. Tschermak, L. Zur Karte der Wuchsgebiete des österreichischen Waldes. [**A map of the growth regions of the Austrian forests.**] *Öst. Vjschr. Forstw.* 94 (1), 1953 (29–35). 10 refs. [G.]

Presents a map showing 8 regions, with brief notes on the situation and vegetation of each.

114. *Soil. Soil Science*

114.1. Soil Physics

See Nos. 2978, 3002, 3006–8, 3155–8.

114.2. Soil Chemistry

See also Nos. 2979–80, 2984–5, 2993, 3002, 3155, 3157, 3468.

2978. Troedsson, T. Den geologiska miljöns inverkan på grundvattnets halt av lösta växtnäringsämnen. [**The effect of the geological environment on the content of nutrients in solution in the groundwater.**] *Skr. K. Skogshögsk., Stockh.* No. 10, 1952. pp. 16. 13 refs. [Sw.sw.e.] Price *Kr*.2.

Samples of groundwater were collected at intervals over 3 years. Tabulated results show that, apart from small seasonal variations, both conductivity and nutrient concentrations are characteristic for the groundwater from different geological types. Conductivity of the groundwater was rather higher at midsummer and in December–February. It is suggested that there is an ion exchange equilibrium between the solid phase of the soil and the groundwater, and on this assumption the annual supplies of nutrients carried in the groundwater flowing down a slope at Bjurfors were calculated as K 5·3 kg./ha., Na 36·8, Ca 39·4 and Mg 17·1. These figures are compared with those for the annual consumption of nutrients in kg./ha. by Spruce and Pine obtained by Ebermayer in 1876.

114.3. Soil Formation. The Soil Profile and its Development. Litter, Humus etc.

See also Nos. 2997, 2999, 3137, 3155 *et seq.*

2979. Gülçur, F. Kuzey Anadolu ormanlarının bazı meşcerelerinde toprak humusu üzerine araştırmalar. [**The humus of some stands in the forests of N. Anatolia.**] *Istanbul Üniv. Orm. Fak. Derg.* 2*A* (1), 1952 (153–84). 18 refs. [Turk.g.]

Gives details of climate, soil, and vegetation types, and the results of chemical analyses to a depth of 5 cm. *From author's summary.*

2980. **Forest soil-water relations in the Piedmont.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 22, [1953] (19–22). (*Rep. Stheast. For. Exp. Sta. 1952*).

Discusses the rainfall storage capacity of sites under different cover types and tabulates figures showing organic matter added annually to forest floors under various Piedmont stands, and % organic matter and N based on oven-dry weight of soil. [Cf. *For. Abstr.* 14 (No. 18).]

2981. Bublitz, W. Über die keimhemmende Wirkung der Fichtenstreu. [**Reduction in germination caused by Spruce litter.**] *Naturwissenschaften* 40 (9), 1953 (275–6). 3 refs. [G.] O.R.S.

Seeds of Pine and Spruce were kept moistened with water or a cold-water extract from litter from a pure Spruce stand, or were kept in contact with damp Spruce litter. Germination of both species was lowered by both the cold-water extract and by contact with the damp litter, more considerably by

the latter. When litter extracts of different concentrations but of constant pH were used, germination decreased with increasing concentration.

2982. LEIBUNDGUT, H. Beobachtungen über den Streueabbau einiger Baumarten im Lehrwald der E T H. **[Observations on the decomposition of litter of several tree species in the demonstration forest of the E.T.H., Zurich.]** *Schweiz. Z. Forstw.* 104 (4/5), 1953 (179–92). 7 refs. [G.g.f.]

Litter decomposition was studied in pure Spruce in a natural mixed broadleaved forest. Species had very different rates of decomposition but in all cases the relative differences remained steady. The litter of different species had different effects on the soil bacterial flora, activity of earthworms, and biological activity of the soil. The Lime (*Tilia parvifolia*) had a particularly favourable influence in this respect, while Beech, often employed alone as understorey and soil improver, had no apparent effect. In general the study emphasized the value of broadleaved species for soil conservation.

2983. JOHNSTON, D. R. **A laboratory study of the decomposition of vegetable débris in relation to the formation of raw humus.** *Plant & Soil* 4 (4), 1953 (345–69). 14 refs.

The evolution of ideas on raw-humus formation is briefly reviewed. It is shown experimentally that mixtures of the litters of Spruce and Hazel, Spruce and Hornbeam, and Spruce and *Epilobium angustifolium*, have no mutual effect so far as rate of decomposition is concerned ('decomposition' here and elsewhere throughout the paper is used in a sense synonymous with 'loss in weight'). Some evidence is provided that mixtures of the litter of Spruce and Red Oak, and Spruce and *Pinus radiata*, decompose more rapidly than either constituent alone. A new technique of carrying out periodic determinations of O absorption on living material is described. The progress of decomposition of the litter of Spruce, Red Oak, and various mixtures of Spruce and Red Oak was compared for the period of a year. It is shown that whereas Spruce litter respired more rapidly at the beginning of the period, this tendency is reversed after about 8 months. The effects of moisture, temperature and inorganic nutrients upon the rate of decomposition of B-horizon and H-layer humus were investigated. It is shown that in all cases the absolute effects are small. In the case of H-layer material, temperature + humidity and humidity + fertilizer are all highly significant. In the case of B-horizon material, temperature and temperature + humidity are significant. It is suggested that the rate of decomposition is not a fundamental factor in mull or mor formation. A tentative deduction is made that if qualitative changes are to be wrought in raw humus they must be initiated in the litter stages since the later humic stages are relatively intractable. *Author's summary.*

2984. DUCHAUFOUR, P. De l'influence de la chaleur et des radiations sur l'activation de l'humus forestier. **[The influence of heat and radiation on the activation of forest humus.]** *Rev. for. franç.* 5 (3), 1953 (204–12). [F.]

Pursuing his studies in the activation of forest humus [cf. *For. Abstr.* 13 (No. 1818)], the author has studied the effect of felling in Spruce stands in two mountain sites (in the Vosges and Doubs respectively). Observations were made of the A horizons, (*a*) in the undisturbed stands, (*b*) in recent openings, and (*c*) in old (3- to 4-year) openings. The results showed a progressive increase, from (*a*) to (*c*), in pH, and rapid decrease in organic matter, amounting almost to the disappearance of the A_0 horizon and a decrease in the C/N ratio and total N%. Mineral N% and mineral-N/total-N ratio increased considerably in the recent openings and declined in the older openings. This initial stimulating effect of opening lasts for several years on calcareous soils but is of shorter duration on siliceous soils, particularly in an Atlantic climate. The practical consequences of this sequence of events is very favourable to regeneration soon after felling, but if regeneration is not quickly established it leads to invasion by acidiphile vegetation and severe soil degradation.

2985. BLOOMFIELD, C. **A study of podzolization. Part I. The mobilization of iron and aluminium by Scots Pine needles.** *J. Soil Sci.* 4 (1),1953 (5–16). 12 refs.

[Cf. *For. Abstr.* 14 (No. 943).] A study of the properties of aqueous extracts of Pine needles showed that such extracts can bring about the solution of ferric and aluminium oxides by a non-biological process, during which the ferric Fe is reduced to the ferrous state. The processes of solution and reduction take place under neutral and aerobic conditions. The ferrous Fe formed by the extract, and possibly the dissolved Al are present in the form of organic complexes. The rate of oxidation of the ferrous complex is low, although it increases appreciably with increasing pH. At pH 7 oxidation appears to result in the formation of a soluble ferric complex, and the total Fe in solution remains virtually constant; at pH 4 oxidation results in precipitation of the oxidation products. The ferrous complex is not readily decomposed under alkaline conditions, relatively large amounts of Fe remaining in solution at pH 8. *From author's summary.*

2986. BLOOMFIELD, C. **A study of podzolization. Part II. The mobilization of iron and aluminium by the leaves and bark of *Agathis australis* (Kauri).** *J. Soil Sci.* 4 (1), 1953 (17–23). 3 refs.

Both leaves and bark of *A. australis* contain readily extractable water-soluble compounds which will dissolve ferric and aluminium oxides, the former being reduced to the ferrous state, even under aerobic conditions. The ferric oxide is mobilized in the form of a ferrous organic complex of considerable stability. The action of the Kauri litter markedly resembles that of Scots Pine. *From author's summary.*

114.4. Soil Classification. Soil Types

See also Nos. 2985–6, 2994–5, 3135, 3155, 3342.

2987. NOIRFALISE, A., and CALEMBERT, J. La forêt de Marche-les-Dames: esquisse pédologique et phytosociologique. **[The forest of Marche-les-Dames: a pedological and phytosociological sketch.]**

Bull. Soc. for. Belg. 60 (4), 1953 (177–88 + 1 photo). [F.]

2988. MANCINI, F. I terreni della regione Vulsinia con particolare reguardo alle zone boscate. **[The soils in the neighbourhood of Bolsena with particular reference to the wooded zones.]** Accademia Italiana di Scienze Forestali, Florence. 1952. pp. 59 + 9 photos. 52 refs. [It.f.]

A study of volcanic soils of comparatively recent origin. The natural vegetation types are Mediterranean maquis on the warmer sites and Chestnut and *Quercus ilex* woodland on the higher and cooler sites.

2989. Mapa agronómico nacional de España. Zonas de suelos. Navas de Oro. **[National land use map of Spain. Soil types. Navas de Oro.]** Comisión Directora del Mapa Agronómico Nacional. 1951. Scale 1 : 50,000.

Cf. *For. Abstr.* 14 (No. 4028).

2990. KOBATA, H., *et al.* **[Forest soils of Japan, Report 2.]** Government Forest Experiment Station, Meguro, Tokyo. 1952. pp. 122. 24 refs. [Jap.e.]

[Cf. *For. Abstr.* 14 (No. 26).] Surveys the soils and vegetation of the Sejiri, Higashikanbara and Hayadegawa, and Ohdochi National Forests.

2991. **[Soil maps: Forest soils of Japan. Report 2.]** Government Forest Experiment Station, Meguro, Tokyo. 1952. [Jap.]

Contains 7 soil maps, scale 1 : 20,000, illustrating papers in the report. [See preceding abstract.]

2992. LEENHEER, L. DE, HOORE, J. D', and SYS, K. Cartographie et caractérisation pédologique de la catena de Yangambi. **[Mapping and classification of the soils of the Yangambi catena.]** *Publ. Inst. nat. Étude agron. Congo belge* (*Sér.sci.*) No. 55, 1952. pp. 62. 22 refs. [F.] Price *Fr.*50.

114.5. Soil Fertility. Soil Toxicity. Soil Depletion and Exhaustion

See also Nos. 3277, 3605–8.

2993. SCHÖNHAR, S. Untersuchungen über die Korrelationen zwischen der floristischen Zusammensetzung der Bodenvegetation und der Bodenazidität sowie anderen chemischen Bodenfaktoren. **[Investigations on the correlation between species composition of the ground vegetation, and soil acidity and other chemical soil factors.]** *Mitt. Ver. forstl. Standortskart.* No. 2, 1952. pp. 24 + 2 tbls. 56 refs. [G.g.]

The topography, geology and climate of the research area, in the lowlands of Württemberg, are discussed. Plants found in the herb and shrub layer and in the moss layer on moist and fairly dry forest soils, were grouped according to the acidity of the soils on which they occur and given a 'reaction number' ranging from *R* for plants occurring on very acid soils to R_5 for those on neutral to alkaline soils. The average reaction figure (R_m) was found by adding the *R* values of species present on a site and dividing by the number of species. Values ranged from R_m 2·1–2·3 for the herb and shrub layer and 2·2–2·7 for the moss layer of acid-soil Oak/Beech stands to R_m 3·7–3·8 for the herb and shrub layer and R_m 3·6–3·8 for the moss layer of calcareous Beech stands. In spite of seasonal variations in soil acidity, a clear correlation was found between the R_m value of the herb and shrub layer and the mean annual pH value of the A horizon, and between the R_m value of the moss layer and the pH value of the top layer (0–1 cm.) of the soil. A vertical analysis of the soils showed maximum acidity for all except calcareous soils in the middle and lower A horizon, and the minimum acidity in the top soil layer and in the B horizon. On the calcareous soils, acidity generally decreased with depth. The surface acidity of calcareous Beech forest and of Oak/Beech/Hornbeam forests on soil rich in nutrients came within the same range (roughly pH 5·7–6·7) but at about 20 cm. depth differed widely (about pH 7·5 for the calcareous and 5·5 for the non-calcareous soils). Differences in species composition were found only in the herb and shrub layer. A clear correlation was found between the buffer capacity of the soil and acidity, resistance to acidification being highest in the least acid soils and in the least acid layers of the soil. Investigations in first-generation Spruce stands on comparable sites also showed a close relationship between the R_m value of the ground flora and soil acidity. Species composition in the herb and shrub layers on the less acid soils was similar to that under hardwoods but with an increased number of the nitrate-demanding species found on clear-felled areas; the composition of the moss layer was quite distinct from that under hardwoods. On the more acid soils, however, there was a sharp increase in the number of *R*, and R_2 plants, and the species of clear-felled areas were absent. The buffer capacity of soil under Spruce decreased with increasing acidity and was lower than that for soils under hardwoods.

2994. HUIKARI, O. Suotyin määritys maa- ja metsätaloudellista käyttöarvoa silmällä pitäen. **[On the determination of wet peat types, especially considering their drainage value for agriculture and forestry.]** *Silva fenn.* No. 75, 1952. pp. 22. 20 refs. [Fi.e.]

The value of wet peatlands for agriculture or forestry after drainage has been found to depend largely on the quality of the surface peat, which in turn is reflected in the vegetation occurring on the undrained peat. The post-drainage capacity of such a site can therefore be estimated with considerable accuracy from its vegetation. The present paper tabulates the classification of such vegetation types now in use in Finland and indicates the nutrient status of the sites sustaining the various types. All tables are given in English as well as Finnish. [Cf. *For. Abstr.* 10 (No. 2341)).]

2995. KELTIKANGAS, V. Suotyyppien liiketaloudellisesta ojituskelpoisuusjärjestyksestä. **[The classification of wet peatlands with reference to the economic possibilities of their drainage.]** *Acta for. fenn.* 58 (4), 1951. pp. 63. 14 refs. [Fi.g.]

The author summarizes his earlier work on the value of vegetation types as indicators of the inherent potentialities of undrained peatlands [cf. *For. Abstr.* 10 (No. 2341)], discusses the aim of drainage works in forest on these types (a half-way stage between

swamp and dry ground, leaving it to forest growth to complete the process), and works out a system of 5 classes (very good, good, satisfactory, adequate, and bad), based on (1) Cajander's vegetation types, (2) Lukkala's scale of drainage suitability [cf. *For. Abstr.* 8 (No. 2691)], (3) Kaitera's classification based on the volume/ha., at the time of drainage, of trees (if any) deemed capable of good growth after drainage.

2996. Haugberg, M. Inndeling i vegetasjonstyper ved landskogtakseringen. **[The division into vegetation types for the Norwegian forest survey.]** *Tidsskr. Skogbr.* 61 (4), 1953 (132–45). 4 refs. [Nor.]

An analysis of the relationship between 6 of the vegetation types used in the survey (forest rich in grass and herbs, forest rich in moss with herbs, [*Vaccinium*] *myrtillus* sites, forest rich in moss with *Calluna*, *Calluna* sites, and lichen sites) and site-quality classes for different species, altitudes and felling classes [cf. *For. Abstr.* 13 (No. 2358)], shows that although the vegetation types can give a general indication of site quality, the range of vegetation on the different sites is too great for their use as a reliable indication of site-quality class.

114.6. Soil Biology

See also Nos. 2982, 2984, 3193–4, 3521.

2997. Smit, J., and Wieringa, K. T. **Microbiological decomposition of litter.** *Nature, Lond.* 171 (4357), 1953 (794–5). 2 refs. [Microbiological Laboratory, Agricultural University, Wageningen.]

An investigation was made to determine what are the organisms opening the attack on dead leaves falling from different tree species in autumn. The microflora of the leaves was found to be much more uniform than might be expected. Yellowed leaves on the point of falling and freshly fallen leaves were collected, shaken for several minutes in sterile tap-water, and plated on malt agar. The species used included *Forsythia*, *Amelanchier*, Oak, Beech, Apple and Peach. A uniform growth soon appeared, consisting almost exclusively of *Pullularia pullulans*. In leaves picked up from the ground, secondary infection is not infrequent. The suspensions of leaves were also plated on pectin agar; nearly all the pectin-splitting groups were again *Pullularia*. When freshly collected leaves were kept between two sterile sheets of filter paper moistened with sterile water, the number of *Pullularia* increased considerably during the first two days and many hundreds were found where only a few had been present previously. It appears that not only does the overwhelming majority of the microflora of dead leaves of many trees consist of *P. pullulans*, but also that this organism is the first to develop in conditions similar to those in newly fallen litter. Experiments with litter in a more advanced state of decomposition, showed that *Pullularia* tends to disappear and is replaced by other organisms, among which bacteria and moulds predominate. Investigations of this secondary flora are in progress.

Some experiments were also made with small green leaves just after their appearance, and also at a time when they were merely green buds. Again, among pectin-splitting organisms, *Pullularia* was frequent and increased enormously when kept between moist filter-paper for 2–3 days. [Cf. *For. Abstr.* 13 (No. 975).]

2998. Macfadyen, A. **Notes on methods for the extraction of small soil arthropods.** *J. Anim. Ecol.* 22 (1), 1953 (65–77 + 2 photos). 22 refs.

Describes, discusses, and suggests improvements in two developments of the Tullgren-type funnel for the extraction of soil organisms.

2999. Birch, L. C., and Clark, D. P. **Forest soil as an ecological community—with special reference to the fauna.** *Quarterly Review of Biology, Baltimore* 28 (1), 1953 (13–36). 92 refs. A.P.B.

Deals only with organisms that are directly or indirectly associated with the breakdown of plant litter. These are grouped broadly on the basis of feeding habits into four main categories: (1) plant litter feeders, (2) fungus feeders, (3) bacterial and algal feeders, and (4) micro- and macro-predators. (1) includes oligochaetes, myriapods, crustacea, ants and termites, oribatid mites and molluscs. In (2) Collembola appear to be important. (3) includes protozoa, myxobacteria and nematodes. The most outstanding feature of the study is the diversity of organisms found. Aspects of the various habitats, such as spaces, heterogeneity of soil constituents and seasonal changes in soil habitats are discussed, and the quantitative study of the rôle of organisms in soil is considered. A procedure is suggested for studying the rôle of different organisms on the basis of the amount of energy that 'flows' through them during a year, the energy being considered in the form of calories, some of which become transformed into heat, and some into the energy of the living tissue of the various organisms.

3000. Gretschy, G. Die Sukzession der Bodentiere auf Fichtenschlägen. **[The succession of the soil fauna on Spruce felling areas.]** *Veröffentlichungen der Bundesanstalt für Alpine Landwirtschaft in Admont, Admont* No. 6, 1952 (25–85). 41 refs. [G.g.] L.S.

Studies were made in four clear-felled areas of different ages, a wind-thrown area, and a 40- to 50-year-old Spruce stand, in order to follow the development of the soil fauna throughout the different stages of natural regeneration. Data are presented on the species found, their numbers and their relationship to the soil and vegetation. The development of some groups of animals is influenced by soil changes, whereas other groups develop in parallel with plant succession. The evolution of the fauna also depends partly on seasonal factors. The areas studied fall into two distinct groups: (1) older clear-felled and wind-thrown areas, and (2) a newly felled area and the high forest. In (1) the soils are incompletely developed; the A horizon is lacking in surface litter and F layer, and is directly superimposed upon the C horizon. The ground cover is dense and there is a well developed moss layer. In such areas Gastropoda and Diplopoda flourish. In (2) the soil shows the normal profile of a brown rendzina, and there is a minimum of herbaceous cover. These conditions favour Apterygota at the expense of other classes.

3001. Stöckli, A. Studien über Bodennematoden mit besonderer Berücksichtigung des Nematodengehaltes von Wald-, Grünland- und ackerbaulich genutzten Böden. **[Studies on soil nematodes with particular reference to the nematode content of forest, pasture and arable soils [in Switzerland].]** *Z. Pflanzenernähr. Düng.* 59 (2), 1952 (97–139). 20 refs. [G.g.] O.R.S.

3002. Hesse, P. R. **Study of the soils of termite mounds.** *Rep. E. Afr. Agric. For. Res. Organ. 1952* [1953] (73–5).

A systematic study by chemical and physical methods of analysis is being made of the soils of the large termite mounds in East Africa. The work has been confined to mounds built by the genus *Macrotermes*, of which there are 3 species. The full report will be published shortly, and some conclusions are already definite. The chief is that termite mounds are built entirely from subsoil collected from a depth of 2–4 ft. This holds good for the mounds of all 3 species, regardless of the soil type, and is limited only by the depth of soil above the underlying rock. Analysis also established the fact that termites do not alter or affect the chemical status of the soil in any way. While a mound is in occupation there is a localized concentration of organic matter and minerals in the area filled with fungus gardens, but this is only temporary. The calcareous deposits in termite mounds are found only when the mound is built of calcareous soil and in or near ground with impeded drainage (in most cases seasonally waterlogged). The explanation seems to be the purely physical one of a large heap of soil being repeatedly inundated with calcium-charged groundwater. Where crops are found to grow better on termite mounds, and the latter are calcareous, the calcium concentration is no doubt a partial explanation of better growth. A more important factor, however, is drainage. Although the mound soils have the same mechanical composition as the adjacent subsoils, their structure is very different, and always superior.

116. *Hydrology. Soil and Water Conservation and Erosion*

See also Nos. 2980, 3342, 3639, 3987.

3003. Pereira, H. C. **Interception of rainfall by Cypress plantations.** *E. Afr. agric. J.* 18 (2), 1952 (73–6). 2 refs.

Interception was measured in a 20-year-old plantation of *Cupressus macrocarpa* and in an adjacent natural Bamboo (*Arundinaria alpina*) forest in the Aberdare highlands in Kenya. Results are given in graphs and tables. The general conclusion from the data is that when Bamboo forests on catchment areas are replaced by Cypress plantations, the interception of rainfall is reduced only during the early stages of the plantation. As the Cypress develops, its average interception equals that of Bamboo and may, in the intervals between thinnings, exceed it. Preliminary studies of soil moisture under both types of cover indicate that the length of time for which the soil is wet enough to permit percolation beyond a depth of 6 ft., is substantially greater under a Cypress plantation than under Bamboo. [Cf. *For. Abstr.* 14 (No. 159).]

3004. Hoover, M. D. **Interception of rainfall in a young Loblolly Pine plantation.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 21, 1953. pp. 13.

In a 10-year-old plantation near Union, S.C., the amounts of rainfall reaching the ground via crown (throughfall) and stem (stemflow) were measured for 10 months. Regression equations for estimating the net rainfall, throughfall and stemflow on the basis of rainfall in the open are presented. Net rainfall averaged about 86% of rain in the open. A considerable proportion of rainfall reached the ground as flow down the stems—ca. 10 in./acre in 57 in. total rain (1948–9). The redistribution of rainfall due to this concentration of rain water at the base of trees is believed to be significant to tree growth and soil moisture. No seasonal differences in the proportion of net rainfall were found. Results apply only to precipitation occurring as rain.

3005. Oomi, S. **[Snow movement on steep slopes and the influence of trees on it.]** *J. Jap. For. Soc.* 34 (3), 1952 (84–8). [Jap.e.]

Results of one winter's measurements on slopes averaging 36° showed that the presence of trees reduces snow movement, and that broadleaved forest has a greater effect than coniferous forest (because of the bushy undergrowth). Where there was no forest, terracing did not seem to affect the movement of snow.

3006. Koščeev, A. L. Značenie drevesnoĭ rastiteljnosti v uvlažnenii i issušenii počv na vyrubkah lesa. **[The relation of woody vegetation to soil waterlogging and drying on felling sites.]** *Dokl. Akad. Nauk SSSR* 87 (2), 1952 (297–9). 2 refs. [Russ.] A.P.B.

From 12 to 15 July, 1951, the transpiration of tree species in Leningrad Province was measured by Ivanov's rapid weighing method [see *For. Abstr.* 14 (No. 66)], giving values for Norway Spruce, Scots Pine, Birch and Aspen of respectively 146, 148, 291 and 347 mg./g. fresh-foliage-weight/hour. From these, the 'transpiration numbers' (Ivanov) were calculated for each species, and an estimate was made of the weight of transpiring foliage in variously aged stands [but no further details are given as to the basis of the calculations]. Graphical comparison of (*a*) the amount of precipitation reaching the ground per year, and (*b*) the possible water consumption per growing season, in transpiration and evaporation, of 6 tree stands and 9 temporarily bogged clearings, lead the author to conclude that: (1) In an 80- to 90-year-old stand of density 0·9 (chiefly Spruce, with ca. 10% each of Birch and Pine plus scattered Aspen), with a foliage mass of 22 tons/ha., (*a*) is 490 and (*b*) 540 mm. The latter figure, as the 'possible' water loss, is of course reduced in practice by what is available. (2) One year after clearing the forest, (*a*) is 650 and (*b*) 170 mm. (3) As continuous moss cover is formed (*a*) remains the same while (*b*) gradually increases to 354 mm. (4) With the appearance, growth and closure of forest regeneration (*a*) gradually falls and (*b*) rises, until for 15- to 20-year regeneration of density 1·0, (*a*) is

520 and (*b*) 557 mm. These figures are put forward as a factual explanation of the temporary bog formation on clear fellings in the northern forests and the disappearance of waterlogging as the young stands become established.

3007. Dils, R. E. **Changes in some vegetation, surface soil and surface runoff characteristics of a watershed brought about by forest cutting and subsequent mountain farming.** *Abstr. of thesis*, in *Dissert. Abstr.* 13 (2), 1953 (146). [Michigan State College.] O.R.S.

On a forested catchment, forest cover was removed in 1940, corn was planted on part of the area, cattle were grazed on another part, and second-growth forest was allowed to develop on the rest. A 1951 vegetation survey indicates that, given protection, shrubs and hardwood trees soon provide cover on cut-over and cultivated areas, but that noxious and unpalatable weeds invade heavily grazed land. Soil loss increased approximately 12 times, the greatest % of loss being associated with cultivation. Infiltration decreased moderately except on the heavily grazed area, where the decrease was pronounced. Analyses of soil samples from 5 sites and 2 surface layers showed decided differences between forest-covered, grazed and cultivated soils, in aggregation, organic matter, density and permeability. As a result of cultivation or grazing, total porosity and capillary-porosity values increased, while non-capillary porosity decreased. The surface run-off % more than doubled for the entire catchment, with a probable increase of 6 to 8 times in the heavily-grazed area. There were marked increases in the magnitude and frequency of flood peaks.

3008. Fushitani, I. **[The water content of forest soils.]** *J. Jap. For. Soc.* 34 (7), 1952 (216–9). [Jap.e.]

Moisture content throughout the year of soils (*a*) under a 15-year-old Hinoki plantation, and (*b*) on adjacent open waste-land, was measured daily or every other day at depths of 0, 10, 20 and 40 cm. (1) The m.c. fell to a minimum at all levels in both, during August. (2) From Sept. to December and from April to June the m.c. was higher in (*a*) than in (*b*); at other times no significant difference was observed.

3009. **[Erosion on logging skid roads.]** *Rep. Ntheast. For. Exp. Sta. 1952*, 1953 (38–40).

First-year measurements of erosion in the Fernow Experimental Forest have been used to develop an alignment chart in which length and steepness of skid-road gradient are the independent variables and the amount of erosion expressed in inches depth over the road surface is the dependent variable. Erosion data for different steepness and length of gradient determined from the chart, are tabulated. Another table shows soil loss from skid roads during and 2 months after skidding for different intensities of use.

3010. Kirwald, E. Lebendbau und Gewässerpflege. **[Living structures and water management.]** *Schriftenreihe der Arbeitsgemeinschaft der Lignikultur-Landesverbände, Hannover* No. 1, 1951. pp. 112. 15 refs. [G.]

Discusses the theory of forest hydrology and water management, the use of different tree species, their propagation and planting, planting trees and bushes, and the use of mats and brushwood on river-banks and steep slopes, the recognition and treatment of unsuitable vegetation on river-banks, tending and maintenance of vegetation, and the causes and control of erosion.

3011. Wettstein, W. Erosionsbekämpfung durch Wiederbegrünung in Wildbachgebieten Vorarlbergs. **[Erosion control by revegetation in the torrent areas of Vorarlberg.]** *Mitt. forstl. VersAnst., Mariabrunn* No. 47, 1951 (38–41). [G.]

For this work it was regarded as desirable to mix species of different rooting depth, in the interest of maximum soil stabilization. A number of suitable species, chiefly Willows, some of local origin, are mentioned. The work is being done in collaboration with the Forstliche Versuchsanstalt, Mariabrunn, under the author's supervision. This Institute has supplied material for trials, on the basis of which a preliminary list of recommended species is given.

3012. Reynolds, E. A. P. **Erosion control and river training undertaken by the Forest Department in Mong Mit State.** *Burmese For.* 2 (2), 1952 (79–85).

3013. Errico, P. d'. Sulla costituzione delle fasce di tamarice nell' Alto Adriatico. **[The establishment of belts of Tamarisk on the Upper Adriatic.]** *Ital. for. mont.* 8 (2), 1953 (75–8). 3 refs. [It.f.]

Tamarisk (*Tamarix gallica*) has been used extensively for sand fixation on the coastal dunes of Venezia [cf. *For. Abstr.* 14 (No. 315)]. It is difficult to grow from ordinary cuttings, but the direct planting of branches 1·5 m. long, with 1 m. of their length buried by placing them against the wall of a trench about 0·5 m. deep, with the end of the branch bent to lie along the bottom, gives excellent results. Two lines of branches are planted in each trench with 25 cm. between branches. A series of 3 trenches is usually planted, parallel to the coast.

3014. Pilla, C. I rimboschimenti litoranei nella Campania. **[Coastal afforestation [of sand dunes] in Campania.]** *Monti e Boschi* 4 (5), 1953 (195–200). [It.f.e.]

Some 1200 ha. of coastal dunes have been afforested in this area. Chestnut palings are first erected to stabilize the sand, which is then planted with Tamarisk and Acacias (*A. cyanophylla*, *A. longifolia*, and *A. saligna*) on the seaward side, and *Pinus pinea* further inland.

3015. Mort, G. W., and Hewitt, B. R. **Vegetation survey of the marine sand drifts of New South Wales: some remarks on useful stabilising species. Part III.** *J. Soil Conserv. Serv. N.S.W.* 9 (2), 1953 (59–69). 3 refs.

[Cf. *For. Abstr.* 12 (No. 1743).] Describes distribution, habit of growth, propagation, etc. of *Acacia sophorae*, *A. cyanophylla*, *Albizzia lophantha* and *Osteospermum moniliferum.*

3016. Glue, D. I. **Stabilising sand country at Flock House Farm of Instruction.** *N.Z. J. Agric.* 86 (2), 1953 (164–9). A.P.B.

Along the beach front of the farm, which is situated near Bulls in Rangitikei County, a sand-trap fence is established to provide a continuous foredune 20–30 ft. high, and the dune is stabilized by *Spinifex* sp. and Marram grass [*Ammophila arundinacea*]. Tree lupins are then sown, and, 2–3 years later, *Pinus radiata*, *P. muricata* and *P. coulteri* are introduced.

14. SYSTEMATIC ZOOLOGY

145.4. Arachnoidea

See Nos. 3517, 3577–8.

145.7. Insecta. Entomology

See also Nos. 3510 *et seq.*, 3892 *et seq.*

3017. SINGH, B. **Immature stages of Indian Lepidoptera. No. 8, Geometridae.** *Indian For. Rec.* (*n.s.*) *Entomology* 8 (7), 1953. pp. 158 + 10 plates. 5 refs. Price *Rs.*4 *as.*8. or 7*s.*

Cf. *For. Abstr.* 13 (No. 3587).

3018. BILIOTTI, E. Importance et signification des arrêts de développement au stade nymphal chez *Thaumetopoea processionea* L. [**The importance and significance of breaks in development in the pupal stage of *T. processionea***.] *C.R. Acad. Sci., Paris* 236 (17), 1953 (1703–5). 4 refs. [F.] O.R.S.

Moths from cocoons collected in 1951 emerged from 16 Aug. to 13 Sept. 1951 and from 20 June to 24 July 1952. In the districts examined, cocoons from which moths had not emerged during the same year ranged from 9 to 50% of the total nest. Cocoons collected before the winter of 1951–2 and kept at 4, 15, 25 and 35° C. did not give moths: those kept at − 5° for 9 days or more and then at 25 or 15° gave moths before the period of natural emergence.

3019. SCHEDL, K. E. Bestimmungstabellen der paläarktischen Borkenkäfer. Teil V: Tribus *Xyloterini*. [**Keys for the determination of the Palaearctic barkbeetles. V: The tribe *Xyloterini***.] *Mitt. forstl. VersAnst., Mariabrunn* No. 47, 1951 (74–100). Many refs. [G.g.]

On the same lines as its predecessors [see *For. Abstr.* 14 (No. 1913)]. No new species are proposed, but redefinition of genera has been necessary, resulting in the abandonment of *Xyloterus* and the erection of the new genus *Dendrotrypum* with 5 Far Eastern species (*D. sordidum*, *majus*, *pubipenne*, *aceris* and *sinense*). The remaining genus *Trypodendron* includes all the other species of the tribe (*T. domesticum*, *signatum*, *gaimaensis*, *proximum* and *lineatum*).

3020. GROSCHKE, F. Zur Überwinterung und Generationenzahl von *Xyloterus signatus* FBR. (Coleopt., Scolytid.). [**Hibernation and number of generations of *X. signatus***.] *Z. angew. Ent.* 34 (3), 1953 (461–2). 8 refs. [G.]

Observations in the region of Darmstadt indicated that *X.* [*Trypodendron*] *signatus* hibernates and has only one generation a year.

3021. FRANCKE-GROSMAN, H. Über Kopulation, Eiablage und Gelbkörperbildung beim Riesenbastkäfer *Dendroctonus micans* Kug. [**Copulation, egg-laying and the formation of the *corpus luteum* in *D. micans***.] *Verhandlungen der Deutschen Gesellschaft für Angewandte Entomologie 1949, Berlin* 1951 (142–53). 16 refs. [G.g.] I.I.E.

149. Mammals

3022. ROSEVEAR, D. R. **Checklist and atlas of Nigerian mammals, with a foreword on vegetation.** Government Printer, Lagos. 1953. pp. 131 + 247 small, 2 large maps + 40 photos. Price 10*s.*

Includes 40 photographs of different vegetation types, a vegetation map (scale 1 : 3,000,000) of Nigeria, and another (scale 1 : 12,000,000) of West and Central Africa.

15. ANIMAL ECOLOGY (INCLUDING GAME AND FISH MANAGEMENT, HUNTING, SHOOTING AND FISHING)

See also Nos. 3039, 3194, 3500 *et seq.*

3023. KETTLEWELL, H. B. D. **Use of radioactive tracer in the study of insect populations (Lepidoptera).** *Nature, Lond.* 170 (4327), 1952 (584–5). [Genetics Laboratory, Dept. of Zoology, Oxford.]

3024. GLASGOW, J. P. **The extermination of animal populations by artificial predation and the estimation of populations.** *J. Anim. Ecol.* 22 (1), 1953 (32–46). 24 refs.

A theoretical study, both parts of which are based on data for weekly catches of *Glossina palpalis* following artificial predation.

3025. GRUZDEV, V. V. O značenii osveščennosti dlja raspredelenija nasekomojadnyh ptic v lesnyh massivah i lesopolosah. [**Importance of illumination for the distribution of insectivorous birds in forests and shelterbelts.**] *Zoologičeskiĭ Žurnal, Moskva* 31 (4), 1952 (556–63). 24 refs. [Russ.russ.] D.S.I.R.

Edges of shelterbelts and forests give birds various facilities, including the best and most varied conditions of illumination, ensuring both the longest working day and the best visibility. Rides are especially important in this respect in the darker parts of forests, particularly on N. aspects.

3026. PAWSEY, C. K. **Some observations on the fauna associated with the coniferous forests of the South-East (S.A.).** *South Australian Naturalist, Adelaide* 26 (1), 1951 (6–9). L.S.

The relationships between the fauna of the region and the extensive coniferous forests established during the past 40 years are still in process of developing. In the more mature Pine stands (15 years old and upwards) the only birds consistently encountered are *Oreocincla lumulata*, *Corcorax melanorhamphus* and *Calyptorhynchus funereus*. In pole-stage woods, *Acanthiza pusilla* and *Sericornis frontalis* have been at home for many years and *Turdus merula* is also established in many places. In young plantations and natural regeneration the bird populations are much more varied and plentiful in proportion to the amount of the original flora remaining or the number of grasses and Compositae growing up after the preparatory burn. Of the mammals *Pseudocheirus laniginosus* [ring-tailed opossum] is breeding in considerable numbers in stands past the sapling stage.

3027. SHORTEN, M. **Some aspects of the biology of the grey squirrel (*Sciurus carolinensis*) in Great Britain.** *Proceedings of the Zoological Society of London* 121, 1951/1952 (427–59 + 4 photos). 37 refs. O.R.S.

Includes discussion on: sub-specific status in Britain; seasonal variations in coat; albino and melanic forms; sex ratio; breeding seasons; breeding rates; breeding in captivity; and growth. Studies on nesting activity over 18 months on 36 acres of mixed woodland showed a preference for winter dreys in Oak, followed by Blackthorn and Maple, while for summer dreys only Oak was used. [Cf. *For. Abstr.* 14 (No. 3504).]

16. GENERAL BOTANY

160. *Plant Chemistry*

See also Nos. 3063, 3105, 3303, 3735 *et seq.*, 3964 *et seq.*

3028. TKALIČ, S. M. Soderžanie železa v rastenijah kak poiskovyĭ priznak. **[The Fe content of plants as an aid in prospecting.]** *Priroda, Moskva* 42 (1), 1953 (93–5). 4 refs. [Russ.] A.P.B.

Includes some few figures illustrating the variation in Fe content of leaves of *Betula verrucosa* and *Abies sibirica* growing over different ore-bearing rocks, urging the practical advantage of using this readily determined element as a diagnostic aid in prospecting and geological reconnaissance work, and the need for wider experiments on this question.

3029. PLOUVIER, V. Sur le pinitol des conifères et le québrachitol des Acéracées; recherche de ces deux itols dans quelques autres familles. **[Pinitol in conifers and quebrachitol in Aceraceae: their presence in some other families.]** *C.R. Acad. Sci., Paris* 236 (3), 1953 (317–9). 9 refs. [F.] O.R.S.

Pinitol was isolated from a number of conifers (branches of 15 Pinaceae examined and from *Thuja occidentalis*, leaves of 3 species of *Pinus*, and from the genera *Cycas* and *Cryptomeria*), mannitol from *Larix decidua*, and quebrachitol from 7 species of *Acer*. Pinitol was not found in 25 species from the Moraceae, Euphorbiaceae and Apocynaceae, and quebrachitol only in *Cannabis sativa* and *Acalypha indica*, although both had previously been reported from individuals of these 3 families. [Cf. *For. Abstr.* 13 (No. 3595).]

161. *Physiology*

See also Nos. 3006, 3071, 3149–50, 3161–7, 3191–2, 3293, 3303, 3523, 3637, 3883–5.

3030. VYVYAN, M. C., and TROWELL, G. F. **A method of growing trees with their roots in a nutrient mist.** *Rep. E. Malling Res. Sta. 1951/52*, 1953 (95–8 + 2 photos).

A method is described for growing trees with their roots in a fine mist of nutrient solution. The mist is produced by atomizers working on the scent-spray principle. The mist condenses and runs back into the tank, thus the solution circulates without passing through a pump. *Authors' summary.*

3031. EISENZOPF, R. Ionenwirkungen auf die kutikuläre Wasseraufnahme von Koniferen. **[The influence of ions upon the uptake of water through the cuticle of conifers.]** *Phyton, Annales Rei Botanicae, Horn, N.-Ö.* 4 (1/3), 1952 (149–59). 17 refs. [G.g.] O.B.D.

The amount of water taken up through the cuticle of immersed conifer needles was about equal to or $\frac{1}{3}$ less than that transpired by the same needles under laboratory conditions. The uptake is dependent upon capacity for and degree of swelling, and can be influenced by H ions and by other cations and by anions. The dependence upon pH can be illustrated by a curve of maximum uptake, having its peak at the point of neutrality. The cations and anions influence uptake in inverse proportion to their capacity for increasing swelling.

3032. PARKER, J. **Desiccation in conifer leaves: anatomical changes and determination of the lethal level.** *Bot. Gaz.* 114 (2), 1952 (189–98). 19 refs. O.B.D.

Presents the results of studies of the changes in needles of *Pinus nigra* var. *austriaca* and *P. strobus* during gradual drying and rehydration, the rate of CO_2 release from drying needles, and the usefulness of the tetrazolium chloride test as a measure of viability. [Cf. *For. Abstr.* 14 (No. 160).]

3033. FRASER, D. A., and MAWSON, C. A. **Movement of radioactive isotopes in Yellow Birch and White Pine as detected with a portable scintillation counter.** *Canad. J. Bot.* 31 (3), 1953 (324–33 + 3 photos). 11 refs. O.R.S.

Both Ca^{45} and Rb^{86}, injected into Yellow Birch, moved up the trunk in the xylem in a relatively narrow channel, about 1 in. wide, spiralling upwards usually dextrally from the point where the isotope was first introduced. The maximum upward rate of Rb^{86} in the xylem of healthy Yellow Birch was about 1 ft./min., slowing down after a height of 10 ft. was reached. Slow downward movement was detected in the bark segments after 2 hours. In a tree in an advanced stage of decay there was only a very slow upward movement, and the downward movement in the bark tissue, occurring after 24 hours, was not localized in a definite channel as in healthy trees, but spread downward over a fan-shaped area. In October, Rb^{86} was injected into a tree retaining its leaves but with an abscission layer already forming. Two hours after the injection there was no upward movement but an active downward movement in the bark tissue. During the following week the isotope continued to move downward along a 1-in. channel and passed into a single branch root in increasing intensity. Ca^{45} in White Pine had a localized distribution similar to that of the Rb^{86} in Yellow Birch.

3034. BUKATSCH, F. Ascorbinsäure-Gehalt und Atmungsintensität. **[Ascorbic-acid content and respiration rate.]** *Phyton, Annales Rei Botanicae, Horn, N-Ö.* 4 (1/3), 1952 (35–45). 12 refs. [G.g.] O.B.D.

Investigations on leaves from the north and south aspects of the crowns of a number of hardwoods confirmed that leaves from the south aspect have the

higher vitamin C content. Tests of the respiration of leaves show a correlation between ascorbic acid content and CO_2 production, which points to a direct connexion between vitamin C level and respiration rate.

3035. POLLOCK, B. M. **The respiration of *Acer* buds in relation to the inception and termination of the winter rest.** *Physiol. Plant, Copenhagen* 6 (1), 1953 (47–64). 35 refs. [E.]

Presents preliminary results of studies to determine the O uptake and CO_2 production of intact and dissected terminal buds, and the effect on these processes of changes in oxygen % and season.

3036. BOLLARD, E. G. **Nitrogen metabolism of Apple trees.** *Nature, Lond.* 171 (4352), 1953 (571–2). 6 refs. [Fruit Research Station, D.S.I.R., Auckland, N.Z.]

It has been shown that in the Apple tree, the tracheal sap contains some N throughout the year and at times is comparatively rich in this element. It seems that a significant part, if not all, of the N absorbed by the root system passes to the scion in the xylem sap. The view that complete reduction of nitrate to amino-acids occurs in the roots is substantiated; apart from a small amount of NH_3, the N of amino-acids and amides accounts for all the N in the tracheal sap.

3037. BOUDON, S. Étude de lipolyse au cours de la germination des graines de Pin maritime. [**Study of lipolysis during germination of seeds of *Pinus pinaster*.**] *Rev. gén. Bot.* 60 (711), 1953 (284–313). 15 refs. [F.] O.B.D.

The process of lipolysis during germination liberates fatty acids which accumulate in the two parts of the seed, but particularly in the endosperm. In the plumule, degradation and utilization of the fatty acids is much more rapid.

3038. WYKES, G. R. **The influence of variations in the supply of carbohydrate on the process of nectar secretion.** *New Phytol.* 51 (3), 1952 (294–300). 15 refs. O.R.S.

Ringing and defoliating treatments of flowering shoots of Horse Chestnut in field experiments, reduced the secretion of nectar, showing that the supply of carbohydrates may become a limiting factor for its secretion. Sugar-feeding experiments on Apple, Loganberry, Medlar, Raspberry and Cherry in the laboratory showed that the concentration of nectar and the amount of sugar secreted varied with the sugar concentration of the feeding solution, but the weight of nectar did not.

3039. ROBINSON, I. **On the fauna of a brown flux of an Elm tree, *Ulmus procera* Salisb.** *J. Anim. Ecol.* 22 (1), 1953 (149–53). 7 refs.

Observations were made on an Elm-tree brown flux in Sheffield over a period of 2 years. During this time the flux had a continuous existence and carried a fauna that formed a balanced association which is described.

3040. BLOCH, R. **Wound healing in higher plants. II.** *Bot. Rev.* 18 (10), 1952 (655–79). 81 refs.

A review based on world literature. [Cf. *For. Abstr.* 3 (306).]

163. *Embryology*

3041. RAMAKRISHNAN, V. **Syncotyly in *Terminalia catappa* Linn. and *Casuarina equisetifolia* Linn.** *Sci. & Cult.* 18 (8), 1953 (389–90). 2 refs. E.M.B.

164. *Morphology*

See also Nos. 3112, 3125, 3184, 3295.

3042. JOHNSON, M. A. **The shoot apex in gymnosperms.** *Phytomorphology, Delhi* 1 (3/4), 1951 (188–204). 71 refs. O.B.D.

A study, based on literature, of the morphology of Cycadaceae, Ginkgoales, Pinaceae, Araucariaceae, Sciadopitaceae, Taxodiaceae, Cupressaceae, Cephalotaxaceae, Taxaceae, Saxegothaeaceae, Podocarpaceae, Ephedraceae, Gnetaceae and Welwitschiaceae.

3043. CAMEFORT, H. Évolution de la phyllotaxie et de la taille du point végétatif de *Cupressus macrocarpa* Hartw. pendant les trois premières années de son développement. [**Evolution of the phyllotaxy and of the size of the growing point of *C. macrocarpa* during the first 3 years of its development.**] *C.R. Acad. Sci., Paris* 236 (8), 1953 (847–9). 1 ref. [F.] O.R.S.

3044. PIJL, L. VAN DER. **Absciss-joints in the stems and leaves of tropical plants.** *Proc. ned. Akad. Wet. 55C* (5), 1952 (574–86 + 6 photos). 9 refs. [E.] [University of Indonesia, Bandung.] O.R.S.

Describes the articulated leaf- and stem-joints of some tropical plants, discusses literature on abscission in woody plants, and describes the anatomical structure of joints in older branches of *Gnetum gnemon* and *Agathis alba*.

3045. GROULX, G. and LOUIS-MARIE, PÈRE. Étude sur les érables du Québec. II. Les bourgeons des *A. platanoides*, *A. saccharum* et *A. saccharinum*, *A. spicatum* et *A. pensylvanicum*. [**Study of the Maples of Quebec. II. The buds of *A. platanoides*, *A. saccharum*, *A. saccharinum*, *A. spicatum* and *A. pensylvanicum*.**] *Revue d'Oka, La Trappe* 27 (2), 1953 (41–3) [F.] A.P.B..

A morphological study.

3046. HOMÈS, J., BALASSE, E. J., and BUREAU, A. Contribution à l'étude de l'anatomie foliaire du genre *Trichilia*. [**The leaf anatomy of the genus *Trichilia*.**] *Bull. Soc. Bot. Belg.* 85 (1), 1952 (83–90). 3 refs. [F.] O.B.D.

3047. NAGARAJ, M. **Floral morphology of *Populus deltoides* and *P. tremuloides*.** *Bot. Gaz.* 114 (2), 1952 (222–43). 34 refs. O.B.D.

165. *Phylogeny, Evolution. Heredity, Genetics and Breeding, Variation*

See also Nos. 3149, 3171, 3191, 3265, 3270–6, 3279–80, 3318.

3048. MATTHEWS, J. D. **Forest tree breeding in Britain.** *Z. Forstgenet.* 2 (3), 1953 (59–65). Numerous refs. [E.e.g.]

Summary of work done in Great Britain, with some emphasis on methods of propagating from cuttings.

3049. BUCHHOLZ, E. Neuere sowjetische Arbeiten über Forstpflanzenzüchtung und forstliche Samenkunde. **[Recent Soviet work in forest tree-breeding and seed selection.]** *Z. Forstgenet.* 2 (3), 1953 (65–70). 46 refs. [G.]

A review of Soviet literature since 1912.

3050. MERGEN, F. **Selection and breeding of Longleaf Pine.** *Naval Stores Rev.* 63 (7), 1953 (12–4, 23–6).

A brief summary of the work of the Southeastern Forest Experiment Station, Lake City.

3051. BOUVAREL, P. L'amélioration des arbres forestiers aux États-Unis: l'Institut de génétique forestière de Placerville (Californie). **[Forest tree breeding in the U.S.A.: the Institute of Forest Genetics, Placerville, California.]** *Ann. Éc. Eaux For. Nancy* 13 (1), 1952 (1953), (205–92 + 15 photos). [F.f.g.e.]

Report on a visit in 1951, dealing mainly with hybrid Pines.

3052. DUFFIELD, J. W., and RIGHTER, F. I. **Annotated list of Pine hybrids made at the Institute of Forest Genetics.** *For. Res. Note Calif. For. Range Exp. Sta.* No. 86, 1953. pp. 9. 10 refs.

Lists 23 Pine hybrids with notes on growth and resistance to insect and fungus attack.

3053. BINGHAM, R. T., SQUILLACE, A. E., and DUFFIELD, J. W. **Breeding blister-rust-resistant Western White Pine.** *J. For.* 51 (3), 1953 (163–8). 5 refs.

A progress report, dealing particularly with hybridization of *P. strobus* and *P. monticola* with allied White Pines from Europe and Asia. [Cf. *For. Abstr.* 14 (Nos. 89, 993).]

3054. LARSEN, C. S. **Studies of diseases in clones of forest trees.** *Hereditas, Lund* 39 (1/2), 1953 (179–92). 4 refs. [E.] O.R.S.

Quotes examples showing the varying susceptibility of different clones of *Larix* spp. and hybrids, *Pseudotsuga taxifolia*, and *Thuja plicata* to insect and fungus attack.

3055. LANGNER, W. Eine Mendelspaltung bei Aurea-Formen von *Picea abies* (L.) Karst. als Mittel zur Klärung der Befruchtungsverhältnisse im Walde. **[Mendelian segregation in *aurea* forms of *P. abies* as a means of establishing fertilization relationships in a forest stand.]** *Z. Forstgenet.* 2 (3), 1953 (49–51 + 1 dgm.). [G.g.e.]

A fuller account of the observations reported in *For. Abstr.* 14 (No. 1046).

3056. MIKAELSEN, K. Hurtigmetode for kromosomundersøkelser i vegetative skudd hos gran og bjørk. **[A rapid method for chromosome studies on vegetative buds of Spruce and Birch.]** *Medd. norske Skogforsøksv.* 11 (3) (No. 40), 1952 (507–23). 5 refs. [Nor.e.]

Terminals (15–20 cm. long for Spruce and rather longer for Birch) from dormant branches were collected in late autumn, stored in the laboratory at − 3° C. till spring, and then allowed to stand in water for several weeks. Excised buds were treated with a 0·002 *M* solution of oxyquinoline for 4 hr., fixed in Carnoys fixative, subjected to hydrolysis in 96% ethanol/conc.HCl for 20–30 min., and rinsed in water; single needles or leaves were excised from the bud and crushed in a 1% solution of lacmoid in 45% acetic acid. Slides were sealed temporarily and after standing for 4 days were made permanent with well-aged (acid) Euparal. In Spruce, bud length was found to be an index to the predominating stage of cell division. Mitosis was absent in vegetative buds 1–2 mm. long and largely confined to those 3–5 mm. long, a length of 3 mm. yielding most cell divisions. Reproductive buds provided microspore mitosis preparations as follows: length 1–2 mm., early prophase I; 3 mm., diakinesis to tetrads; 4–5 mm., tetrads to pollen mitosis and completed divisions; and 6 mm., mature pollen. Buds fixed between 4 p.m. and midnight showed significantly more cell divisions than those fixed at other times of day. The staminate flower buds of Birch contained only mature pollen, so no meiotic examination was possible. Vegetative buds proved to be at the height of mitosis when the young leaves began to emerge between the bud scales, 21 days after the branches were started in the greenhouse, compared with 10–14 days for Spruce.

3057. KHAN, M. I.-U.-R. **Cyto-genetical studies in some species and hybrids of *Acacia* and *Larix*.** *Punjab (Pakistan) For. Rec.* 1 (1), 1951. pp. 48 + 5 plates. 115 refs.

Acacia senegal, *A. mellifera*, *A. modesta* and *A. decurrens* × *A. mollissima* all have a chromosome number of $2n = 26$. The apparent hybrid *A. senegal* × *A. mellifera* showed $2n = 39$ or 40 in the somatic nucleoli of its progeny. It is considered that all the 13-chromosome Acacias are secondarily balanced polyploids. *A. arabica* and *A. farnesiana* are both tetraploids. The Australian Acacias of the *decurrens* group have very similar chromosome morphology and are mainly diploids. The influence of cytogenetical characters on the possibility of artificial hybridization and induced polyploidy are discussed.

The somatic chromosome number of *Larix laricina* was found to be $2n = 24$. A basic chromosome number of 6 is suggested for the genus *Larix*. On cytological grounds it is considered that *L. decidua*, *L. decidua* var. *polonica* and *L. sibirica* are closely related. *L. leptolepis* has larger chromosomes and is regarded as more primitive than any of the other species studied. *From author's summary.*

3058. CHIBA, S., and WATANABE, M. **Tetraploids of *Larix kaempferi* in the nurseries.** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 57, 1952 (187–202). 27 refs. [E.e.jap.]

Of 20 two-year-old plants selected on general appearance, 8 were found to be tetraploid. Two of these were partial tetraploids, having diploid roots and part or all of the shoot tetraploid. Guard cells in tetraploids were 23–40% longer and the stomata/unit-area 25–44% fewer than in diploids. Tetraploids lacked the giant form of those of *Cryptomeria japonica* [cf. *For. Abstr.* 13 (No. 2779)], but were characterized by thick, tough needles, the presence of connatus needles and twisted needles, and rather fewer needles to the shoots. Colour was not a satisfactory criterion. The origin of tetraploidy in

L. leptolepis is discussed. [Cf. *For. Abstr.* 14 (No. 1947).]

3059. ZINNAI, I. **[Tetraploid plants of Japanese Red Pine (*Pinus densiflora* Sieb. et Zucc.) discovered in transplant beds.]** *J. Jap. For. Soc.* 34 (6), 1952 (185–7). 5 refs. [Jap.e.]

In 1951, 5 tetraploid plants of *P. densiflora* were found among 6048 1 + 2 transplants. The characteristics of 1- and 2-year needles of the tetraploid plants were less regular than those of diploid plants, suggesting that chromosome doubling takes place at a late stage of embryo development or during the first stage of germination. In selecting polyploids, 1- and 2-year seedlings are suitable. *From author's summary.*

3060. TOYAMA, S., NAGATA, J., OKAMOTO, K., and YOSHIDA, M. **[The properties of 'Kuromatsu No. 26'. (No. 4). The external form and volume increment and the anatomy of the needles.]** *J. Jap. For. Soc.* 34 (6), 1952 (188–92). 5 refs. [Jap.e.]

'Kuromatsu [*Pinus thunbergii*] No. 26' in the Otsuchiyame State Forest in the prefecture of Hiroshima is superior in external form and volume increment to 3 other Pines. The hypodermal cells of the needle are in 3 rows. Stomata are more numerous and larger than those of the other Pines. The large resin passages are 2·5 to 3 times the size of the small ones; 2 out of every 10 counted were in contact with the epidermis.

3061. WAKELEY, P. C. **Studies of geographic races of Southern Pines.** *Naval Stores Rev.* 62 (51), 1953 (12–3, 30).

Discusses known facts about the existence of different races of Southern Pine, and summarizes briefly research in that field achieved to date by a Subcommittee of the Committee on Southern Forest Tree Improvement.

3062. KRAHL-URBAN, J. Hinweise auf individuelle Erbanlagen bei Eichen und Buchen. **[Indications as to individual inheritance in Oak and Beech.]** *Z. Forstgenet.* 2 (3), 1953 (51–9). 22 refs. [G.g.e.]

Observations made in the Lehrforstamt Bramwald on early and late flushing, leaf-fall and colour change, branch and crown formation, and spiral grain, confirmed the advisability of making some kind of selection in natural regeneration of Beech and Oak, if necessary replacing seedlings from stock with poor growth characteristics by plants or seeds of known good parentage. There seems to be a definite correlation between spiral grain and twisted growth of branches, which offers the possibility of early diagnosis of this defect.

3063. PENFOLD, A. R., and WILLIS, J. L. **Physiological forms of *Eucalyptus citriodora* Hooker.** *Nature, Lond.* 171 (4359), 1953 (883–4). 5 refs.

In 1948 the occurrence of a physiological form of *E. citriodora* was recorded in which citronellal, the principal constituent of the type, had been almost entirely replaced by an equivalent amount of citronellol and its esters [cf. *For. Abstr.* 10 (No. 2465)]. Yield was 1·4%. Seed from open-pollinated flowers of this individual was collected and 243 individuals were raised. These showed great variations in both oil composition and yield. The oils may be grouped into four series as follows. (1) Aldehydes 65–85%, corresponding to a normal 'type' *E. citriodora* (77 trees equalling 40·1% of the oils analysed). (2) Aldehydes less than 30% and very soluble in 70% alcohol, corresponding to the original parent tree (40 trees equalling 20·8%). (3) Aldehydes less than 30% but highly insoluble in 70% alcohol (9·8%). (4) Aldehydes 30–50%: this group is intermediate between groups (1) and (2), and accounted for 29·2% of the oils analysed. A further survey of the area where the original variant was found led to the discovery of two forms corresponding to groups (3) and (4).

3064. PRYOR, L. D. **Variable resistance to leaf-eating insects in some Eucalypts.** *Proc. Linn. Soc. N.S.W.* 77 (5/6), 1952 (364–8 + 3 photos). 7 refs. D.S.I.R.

Progeny tests and morphological analyses of *Eucalyptus* hybrids indicate that, in some species, resistance to leaf-eating scarab beetles is a heritable character, probably with some capacity to assort independently in segregating populations. *Author's summary.*

3065. HALL, M. T. **A hybrid swarm in *Juniperus*.** *Evolution* 6 (4), 1952 (347–66). 10 refs. [Cranbrook Institute of Science.] O.R.S.

A hybrid swarm between *J. ashei* and *J. virginiana* from Platt National Park in the Arbuckle Mountains of Oklahoma is discussed. [Cf. *For. Abstr.* 14 (No. 91).]

3066. REIMER, C. W. **Preliminary study of the effect of topography on the distribution of Sugar and Black Maples and their intermediate forms.** *Abstr.* in *Proc. Indiana Acad. Sci.* 61, 1951 (1952), (70–1). A.P.B.

Analyses were made of Maple leaves collected from 2 stands in Indiana and 1 in Michigan. In the Michigan stand 11% of leaves were considered intermediate forms between *Acer saccharum* and *A. nigrum*. In the Indiana stand, totals of 36% and 46% were recorded as intermediate forms. In all areas introgression appears to favour *A. saccharum*, though this tendency is more striking in the Michigan woodlot. *A. nigrum*-like specimens are restricted to a lowland, slightly cooler, more shady and possibly moister habitat. The habitat for *A. saccharum*-like specimens seems not to be so select, but of the 3 collection sites (viz. lowland, slope and upland) the upland produces most.

3067. PJATNICKIĬ, S. S. Opyt skreščivanija probkovogo duba (*Quercus suber* L.) s listopadnymi vidami. **[An experiment in crossing *Q. suber* with deciduous Oaks.]** *Dokl. Akad. Nauk SSSR* 87 (2), 1952 (291–2). 6 refs. [Russ.] A.P.B.

Attempts were made, with little success in 1939–40, to cross *Q. suber* with *Q. robur* and *Q. macranthera*. The *Q. suber* pollen had to travel for 4–8 days before use, its viability falling to 40–45% during this period. In 1951 work was resumed with pollen stored, for the 3 days between collection and use, in a thermos with ice to maintain low temperature. On arrival, its viability *in vitro* was 78–86%. The % of

flowers developing into acorns on *Q. macranthera* pollinated with this pollen on 12 May (the third day after flowering began) varied from 16 to 21%, i.e. was very high. At the same time, flowers on the same tree were pollinated with (*a*) a mixture of *Q. suber* and *Q. robur* pollen, and (*b*) *Q. robur* pollen alone: of these 26 and 14%, respectively, developed acorns.

3068. Ozol, A. M., and Zarubin, A. F. Vlijanie uslovii žizni na izmenenie gibridnyh sejancev orehov. **[The influence of environment upon hybrid Walnut seedlings.]** *Dokl. Akad. Nauk SSSR* 87 (2), 1952 (287–90). 5 refs. [Russ.] A.P.B.

Crosses of *Juglans regia, J. cinerea, J. sieboldii* and *J. nigra* were made in S. Kirghizia in spring 1948 for comparative trials of the progeny in that region (1), and in the vicinity of Moscow (2). On 12 ♀ trees of 3 species, 510 inflorescences bearing 1758 ♀ flowers were subjected to controlled pollination, and from these 358 hybrid seeds were obtained. Most success was obtained from pollinations with *J. cinerea* pollen, followed by *J. sieboldii* and *J. nigra*. In region (1), 87 seedlings were raised from 134 hybrid seeds, and in (2) 101 from 132. Parallel sowings were made of an equal number of seeds from open pollination. Three years' observations of growth and winter-hardiness of the progeny, reveal differences in the two regions. In (1) average height growth was better than in (2), and the hybrids, especially if *J. regia* was the mother tree, showed considerably poorer growth than plants from open pollinations and more injury from spring and autumn frost. In (2) the average height growth was lower than in (1), but the hybrids showed better growth and frost resistance than the progeny of open pollination. It is considered that the growth rhythm of the hybrids in (2) shows adaptation to the more northerly environment, their flushing, shoot elongation and leaf-fall occurring earlier than in seedlings from open pollination. It is stated that in (2), where conditions are more or less unfavourable to *J. regia* and favourable to the other species, hybrid seedlings with *J. regia* as the mother resemble the ♂ parent more, whereas in (1) most of the corresponding seedlings differed but little from *J. regia*. Results are held to show that the nature of the hybrid seedlings is largely influenced by the environment.

3069. Pryor, L. D. **A compound *Eucalyptus* hybrid.** *Proc. Linn. Soc. N.S.W.* 77 (5/6), 1952 (361–3 + 9 photos). D.S.I.R.

The existence of a compound hybrid derived from *Eucalyptus rossii, E. dives* and *E. macrorrhyncha* is deduced on the basis of a progeny test. *Author's summary.*

3070. Pozdnjakov, L. K. Mežrodovoï gibrid iz semeïstva rosocvetnyh. **[An intergeneric hybrid in the Rosaceae.]** *Dokl. Akad. Nauk SSSR* 85 (5), 1952 (1161–4). [Russ.] A.P.B.

Describes, and figures leaves of, the natural hybrid *Sorbocotoneaster* (*Cotoneaster melanocarpa* × *Sorbus sibirica*), which is found in two forms, differing chiefly in their leaves, in the underwood of Pine forests in the Aldan valley between the rivers Timpton and Uchur. Some localities are listed with brief accounts of the associated vegetation.

168. *Histology*

See also Nos. 3317, 3523, 3574, 3577–8, 3680 *et seq.*

3071. Jacquiot, C. Observations sur l'histogénèse et la lignification dans les cultures *in vitro* de tissu cambial de certains arbres forestiers. Influence de quelques hydrazides sur ces phénomènes. **[Histogenesis and lignification in culture of the cambial tissue of some forest trees. Effect of some hydrazides on these processes.]** *C.R. Acad. Sci., Paris* 236 (9), 1953 (960–1). 2 refs. [F.] O.R.S.

Partially lignified cells were found in cambial tissues of *Populus tremula, Betula verrucosa, Quercus* sp. and *Castanea sativa* grown *in vitro* [cf. *For. Abstr.* 14 (No. 1051)]. Culture of *C. sativa* showed that the addition of hydrazides to the culture medium inhibited formation of these partially lignified cells.

17. SYSTEMATIC BOTANY

172.3. Bacteria and Blue-green Algae

3072. Soriano, J. D. **On the arboreal blue-green algae in Manila and vicinity.** *Philipp. J. For.* 7 (1/4), 1950 (1952), (83–6 + 1 plate). 4 refs.

Describes 5 species found growing abundantly on the bark of trees during the rainy season.

172.8. Eumycetes (True Fungi)

See also Nos. 3193–4, 3473 *et seq.*, 3516, 3874 *et seq.*

3073. Chiba, O., and Teramoto, T. **[Wood-rotting fungi collected in the Tokyo University forest in Hokkaido.]** *Bull. Tokyo Univ. For.* No. 43, 1952 (19–37). 40 refs. [Jap.e.]

Discusses the most important fungi collected from living trees and from untreated hardwood sleepers on the forest tramways. The species so far identified number 93.

3074. Imazek, R. **A contribution to the fungous flora of Dutch New Guinea.** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 57, 1952 (87–140). [E.jap.]

Lists and describes the fungi collected, and records their distribution in other parts of the world.

3075. Etheridge, D. E. **Comparative studies of North American and European cultures of the root rot fungus *Fomes annosus* (Fr. Cooke).** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 9 (1), 1953 (3).

Preliminary observations on 16 isolates of *F. annosus* from different localities indicate that there are no consistent differences between the two groups.

3076. Curl, E. A., Stessel, G. J., and Zuckerman, B. M. **Subcortical mycelial mats and perithecia of the Oak wilt fungus in nature.** *Phytopathology* 43 (2), 1953 (61–4). 3 refs.

Describes the mycelial mats found under loose bark on 22 wilt-killed Oaks in Illinois. In every case species of Scolytidae, Cerambycidae and Buprestidae were also found beneath the bark. Sclerotium-like pads were present in the centres of

mycelial mats on 20 of the 22 trees. [Cf. *For. Abstr.* 13 (No. 3106).]

3077. Stessel, G. J., and Zuckerman, B. M. **The perithecial stage of *Chalara quercina* in nature.** *Phytopathology* 43 (2), 1953 (65–70). 11 refs.

Fertile perithecia of *C. quercina* were found embedded in subcortical mats that had developed on the surface of the sapwood and inner surface of the bark. The perithecial structures are described and laboratory experiments to determine the sexual characteristics of the fungus and inoculation tests are reported.

3078. Robak, H. ***Dothichiza pithyophila* (Cda.) Petr. the pycnidial stage of a mycelium of the type *Pullularia pullulans* (de B.) Berkhout.** *Repr.* from *Sydowia, Annales Mycologici Ser. II, Horn* 6 (5/6), 1952 (361–2). [E.]

3079. Robak, H. ***Phomopsis pseudotsugae* Wilson—*Discula pinicola* (Naumov) Petr. as a saprophyte on coniferous woods.** *Repr.* from *Sydowia, Annales Mycologici Ser. II, Horn* 6 (5/6), 1952 (378–82). 14 refs. [E.]

As result of a number of observations and laboratory cultures, the author concludes that *D. pinicola* is identical with *P. pseudotsugae*, that the latter is the valid name of the fungus, that this organism is a widespread saprophyte on various conifers and can be reckoned as one of the 'bluing fungi'. Fruiting occurs very rarely on Pine and Spruce in nature. The existence of strains of varying virulence seems probable, and instances of parasitism on Larch are cited.

174. *Spermatophyta, Seed-Plants in General. Floras and Check-Lists*

See also Nos. 3682–92

3080. Pardy, A. A. **Notes on indigenous trees and shrubs of S. Rhodesia.** *Rhod. agric. J.* 50 (1), 1953 (4–6 + 4 plates). E.M.B.

Acacia giraffae and *Adansonia digitata*. [Cf. *For. Abstr.* 14 (No. 1971).]

3081. **Botanical-vernacular and vernacular-botanical names of some trees and shrubs in Mashonaland—with a foreword by E. J. Kelly Edwards.** *Rhod. agric. J.* 50 (1), 1953 (89–107). [Southern Rhodesia Forestry Department.] E.M.B.

3082. Hildebrand, F. H. Boomnamenlijst van Bengkalis (Riouw-Sumatra). **[List of tree species collected in the 'Bengkalis' division (Rhio-Sumatra).]** *Rapp. Bosbouwproefsta. Bogor* No. 59, 1953. pp. 28. [Jav.Du.E.]

The list is in two parts arranged (1) by vernacular names and (2) under family, genus and species. Each gives the scientific name, the vernacular name, its language or dialect, and the durability class of the wood. [Cf. *For. Abstr.* 14 (No. 1010).]

3083. Hildebrand, F. H. Boomnamenlijst van Timor (Kleine Soenda-Eilanden). **[List of tree species of Timor (Lesser Sunda Islands).]** *Rapp. Bosbouwproefsta., Bogor* No. 60, 1953. pp. 53. [Jav.Du.E.]

The list is in two parts arranged (1) by vernacular names and (2) under family, genus and species. Each gives the scientific name, the vernacular name, its language or dialect, and durability class of the wood. [Cf. *For. Abstr.* 14 (No. 1010).]

3084. [Walker, E. H.] **Ryukyu Islands: preliminary notes on the use, distribution and adaptability of native and introduced tree species.** *Special Bulletin, United States Civil Administration of the Ryukyu Islands* No. 1, 1952. pp. 45.

Lists 207 species, showing scientific, English, Japanese and Ryukyu names, whether native or exotic, principal uses, distribution and abundance (of native species), adaptability (of introduced species), adaptability to 9 soil types described in an appendix, and giving additional notes on uses, etc. Brief notes on post-war experience with exotics, on climate and on geology and soils are given. The material is preliminary and subject to correction and is to be published in more detail as 'Important Trees of the Ryukyu Islands'.

3085. Hayashi, Y. **[Notes on Japanese trees (1).]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 57, 1952 (151–62). [Jap.lat.]

The following are described from material collected by the author:—*Abies veitchii* var. *komagatensis* var. nov., *Chamaecyparis obtusa* var. *takeuchii* var. nov., *Alnus hakkodensis* sp. nov., *Carpinus erosa* var. *microcarpa* var. nov., *Ilex senjoensis* sp. nov., *Rhus javanica* var. *toyohashiensis* var. nov., *Tripterygium regelii* var. *hypoleucum* var. nov., *Sakakia ochnacea* var. *serrata* var. nov., *Stachyurus praecox* var. *leucotrichus* var. nov. and *Loiseleuria procumbens* f. *rubra* f. nov.

3086. Kusaka, M. **[New or noteworthy trees and shrubs of Japan (II).]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 58, 1953 (43–8). [Jap.e.]

[Cf. *For. Abstr.* 14 (No. 1001).] Describes with illustrations *Tilia japonica* var. *inaensis* var. nov., two forms of *Zanthoxylum piperitum*, *Callicarpa mollis* f. *latifolia* f. nov., and *Tritomodon campanulatus* f. *hypoleucus* f. nov. *From author's summary.*

3087. Pickel, D. B. J. As principais árvores que dão madeira. (Método prático para o seu reconhecimento). **[The principal [Brazilian] timber trees. (A practical method of identification.)]** *An. bras. Econ. flor., Inst. nac. Pinho* 4 (4), 1951 (143–72). [Port.]

Notes, illustrated by drawings, on: *Luehea grandiflora*, *Melanoxylon brauna*, *Nectandra puberula*, *Cryptocarya moschata*, *Cybistax antisyphilitica*, *Prunus sphaerocarpa*, *Lafoensia pacari*, *Hymenaea stilbocarpa*, *Caesalpinia echinata*, *Balfourodendron riedelianum*, *Sessea brasiliensis*, *Vochysia oppugnata*, *Platymiscium floribundum*, *Caesalpinia peltophoroides* and *Hieronyma alchorneoides*.

3088. Steyermark, J. A., *et al.* **Contribution to the flora of Venezuela. Botanical exploration in Venezuela—II. From Droseraceae through Umbelliferae.** *Fieldiana (Bot.)* 28 (2), 1952 (243–447).

Cf. *For. Abstr.* 13 (No. 986).

174.2. Gymnosperms

See also Nos. 3057, 3065, 3179, 3341.

3089. Morgenthal, J. Die wildwachsenden und angebauten Nadelgehölze Deutschlands. **[The**

wild and cultivated conifers of Germany.] Verlag von Gustav Fischer, Jena. 2nd ed. (rev.) 1952. pp. vii + 228. 13 refs. [G.] Price [19*s.* 0*d.*]

[Cf. *For. Abstr.* 13 (No. 992).] The present edition is considerably expanded: nomenclature has been brought up to date; many bark and habit photos have been added; and there are maps of the chief climatic regions of N. America and Eurasia, with a table giving the mean monthly rainfall and mean monthly temperature of each region.

3090. KOBENDZA, R. Nowa odmiana modrzewia amerykańskiego (*Larix laricina* K. Koch var. *pyramidalis argentea*). [**A new variety of *L. laricina.***] *Roczn. dendrol. polsk. Tow. bot., Warsz.* 8, 1952 (210–4). [Pol.russ.e.]

Describes a Larch growing in one of the Warsaw parks, ca. 10 m. high, 4 m. crown diameter, 35 cm. d.b.h. It is pyramidal and has silvery foliage. The tree was reared from a nursery seedling. This form is not known in literature, and it differs from var. *glauca*, one specimen of which was known in Stockholm some 40–50 years ago. *L. laricina* is a species well adapted to the climatic conditions of Poland.

3091. BURSKI, B. Osobliwy świerk o spękanej korze (*Picea excelsa* L. var. *corticata* Schröter) w Lądku-Zdroju. [**A peculiar Spruce with fissured bark (*P. abies* var. *corticata*) at Lądek-Zdrój.**] *Roczn. dendrol. polsk. Tow. bot., Warsz.* 8, 1952 (219–20). [Pol.russ.e.]

Describes a cone-bearing Spruce tree, 32·5 m. high and 1·45 m. d.b.h., the bark of which is fissured, like that of Larch, to a height of ca. 10 m. up the stem. Higher up, and on the thicker branches, the bark is rough. The needles attain a length of 20 mm. and are square in section; the cones are ca. 15 cm. long × 5 cm. diam.

3092. FERRÉ, Y. DE. Division du genre *Pinus* en quatre sousgenres. [**Division of the genus *Pinus* into four subgenera.**] *C.R. Acad. Sci., Paris* 236 (2), 1953 (226–8). 1 ref. [F.] O.R.S.

Proposes the following subgenera: *Diplopinus* (= *Diploxylon* Koehne), *Cembrapinus* (= *Cembra* Koehne), *Paracembrapinus* (= *Paracembra* Koehne), and *Ducampopinus* (for the single species *P. krempfii*).

3093. PAVARI, A. Una nuova varietà di pino loricato. [**A new variety of *Pinus heldreichii.***] *Monti e Boschi* 4 (3), 1953 (130). [It.]

A description of a variety found recently in Montenegro and named *Pinus heldreichii* Christ. var. *pancici* Fukarek.

3094. HERBIGNAT, A. Le pin de Koekelare ou pin des Flandres. [**The Koekelare or Flanders Pine.**] *Bull. Soc. for. Belg.* 60 (5), 1953 (236–46 + 4 photos). 7 refs. [F.]

Discusses the systematic position and increment of a strain of *Pinus nigra* of unknown origin, naturalized in Belgium. [Cf. *For. Abstr.* 11 (Nos. 2539, 2622).]

3095. NAKAMURA, K. [**The monophyllous Pine at Kokubunji: the anatomical character of its leaves.**] *J. Jap. For. Soc.* 34 (6), 1952 (201–3). 4 refs. [Jap.e.]

Identified as a *P. thunbergii*; monophyllous *P. densiflora* are also known.

3096. GRAY, N. E. **A taxonomic revision of *Podocarpus* VIII. The African species of section *Eupodocarpus*, subsections A and E.** *J. Arnold Arbor.* 34 (2), 1953 (163–75). 10 refs.

176.1. Dicotyledons

See also Nos. 3057, 3066, 3069–70, 3142, 3615, 4049.

3097. KRÜSSMANN, G. Die Laubgehölze: alphabetisches Verzeichnis nebst Beschreibung und Bewertung der in Deutschland winterharten Laubgehölze. Eine Dendrologie für die Praxis. [**Broad-leaved woody species: an alphabetical catalogue with descriptions and appraisal of the species winter-hardy in Germany.**] Paul Parey, Lindenstrasse 44–47, Berlin SW68. 2nd ed. (rev.) 1951. pp. 402. 33 refs. [G.]

A dendrological manual intended chiefly for nurserymen and horticulturists, listing in alphabetical order of their valid names ca. 5850 species, varieties and forms ranging in stature from trees to dwarf shrubs, each being described and many illustrated in line drawings. Horticultural value and degree of winter-hardiness are indicated by conventional symbols. There are separate indexes to German names and invalid botanical names.

3098. KEAY, R. W. J. **Revision of the 'Flora of West Tropical Africa'. III.** *Kew Bull.* 1953 (1), (69–82).

Notes on genera and species in miscellaneous families, including *Monocyclanthus vignei* gen. et. sp. nov. (Annonaceae), *Gymnorinorea* gen. nov. (based on *Rinorea abidjanensis*), *Homalium aubrevillei* and *H. angustistipulatum* spp. nov., and some new combinations.

3099. PICHON, M. Classification des Apocynacées: XXXIII, Les soustribus des Carissées. [**Classification of the Apocynaceae: XXXIII, The subtribes of the Carisseae.**] *Phanérogamie* 14 (4), 1952 (310–5). 3 refs. [F.] O.B.D.

3100. HU, S.-Y. ***Ilex* in Taiwan and the Liukiu Islands.** *J. Arnold Arbor.* 34 (2), 1953 (138–62).

3101. SILLANS, R. Matériaux pour la flore de l'Oubangui-Chari (Bignoniacées). [**Contribution to the flora of Ubangi-Shari (Bignoniaceae).**] *Phanérogamie* 14 (4), 1952 (322–8). [F.] O.B.D.

3102. PERRIER DE LA BATHIE, H. *Adansonia* de Madagascar—clef et diagnoses. [**The *Adansonia* species of Madagascar—key and diagnoses.**] *Phanérogamie* 14 (4), 1952 (300–4). [F.] O.B.D.

3103. LEENHOUTS, P. W.; HUSSON, A. M., and LAM, H. J. **Revision of the Burseraceae of the Malaysian area in a wider sense. 1. *Protium*. 2. *Scutinanthe*. 3. Scandent Burseraceae (*Dacryodes* and *Canarium*). 4. *Dacryodes* in New Guinea.** *Blumea* 7 (1), 1952 (154–70). [E.] O.R.S.

3104. HOOGLAND, R. D. **A revision of the genus *Dillenia*.** *Blumea* 7 (1), 1952 (1–145). [E.] O.R.S.

Includes sections on the history of the genus, morphological notes, anatomy, geographical distribution, vernacular names and uses. The main part of the work consists of a key and descriptions of 55 species.

3105. HYUN, S. **[Serodiagnostic investigation of the affinities of different species of the genus *Quercus* and the genus *Castanea*.]** *Repr.* from *Bulletin of the Kyushu University Forests* No. 17, 1949. pp. 87. 43 refs. [Jap.e.]

Serum containing antibodies was obtained from rabbits that had been injected intravenously or intraperitoneally with solutions obtained from seeds by extraction with physiological salt solution or a dilute solution of alkali. The presence and nature of the antibodies was investigated by means of precipitin reactions, using the Fornet ring test or absorption tests.

Protein extracted by physiological salt solution from ungerminated *Quercus* seeds differs from many proteins in that it is not coagulated by heat, nor is it precipitated by the usual protein precipitants; more important, it does not result in the production of antibodies *in vivo*. Although protein extracted from ungerminated *Quercus* seeds by dilute solutions of alkali is coagulated by heat and precipitated by the usual protein precipitants, it also does not result in the production of antibodies. The non-production of antibodies is ascribed to the nature of the protein rather than to interference by tannin.

Seeds germinated in pots in the greenhouse were found to yield extracts capable of giving rise to antibodies on injection into rabbits. By the use of such extracts the taxonomic relationships between the following were investigated serologically.

Species used in the production of antisera: *Q. variabilis*, *Q. suber*, *Q. serrata*, *Q. dentata* and *Q. acuta*.

Species used for the preparation of antigenic extracts: *Q. acutissima*, *Q. phillyraeoides*, *Q. major*, *Q. aliena*, *Q. mongolica*, *Q. gilva*, *Q. glauca*, *Q. paucidentata*, *Q. myrsinaefolia*, *Q. stenophylla*, *Shiia sieboldii*, *Lithocarpus glabra*, *Castanea crenata*.

From the results the author concludes that:—(*a*) The taxonomic relationships of the different species of *Quercus* as determined serologically agree with the findings of systematists, based on the shape of the cupule scale. (*b*) The evergreen *Q. phillyraeoides* is more closely related to both *Q. variabilis* and *Q. acutissima*, which are deciduous, than to other evergreen Oaks sometimes placed in the genus *Cyclobalanopsis*. (*c*) *Q. suber* is more closely related to *Q. variabilis*, *Q. acutissima* and *Q. phillyraeoides* than to other Japanese oaks.

From similar tests with ungerminated seed of ten indigenous races (nine cultivated and one wild) of the Japanese *Castanea crenata*, the Chinese *C. bungeana*, and the Korean *C. crenata* var. *dulcis*, it was concluded that:—(*a*) Although the different races of Japanese Chestnut cannot be clearly distinguished from each other by the usual precipitin tests, owing to their close relationship, it is possible to differentiate them by absorption tests and by using the solutions containing antigen in closely graded series. (*b*) Although serological relationships between the cultivated races of Japanese Chestnut have not been clearly defined, there seems to be some differentiation according to the time of ripening of the seeds. (*c*) Although the wild Japanese Chestnut is closely related to all its cultivated races, the degree of relationship varies with different races. (*d*) Both the wild and cultivated races of Japanese Chestnut can be clearly differentiated serologically from the Chinese Chestnut. (*e*) Whilst the Korean Chestnut is closely related serologically to the wild race of Japanese Chestnut, it is only remotely related to the Chinese Chestnut. (*f*) Relationships between different species of Chestnut as determined serologically are in agreement with the findings of systematists.

3106. MULLER, C. H. **The Oaks of Texas.** *Contributions from the Texas Research Foundation, Renner* 1 (3), 1951 (21–311). L.B.M.N.

3107. CAMUS, A. Contributions à la flore de l'Asie orientale. **[Contributions to the flora of eastern Asia.]** *Phanérogamie* 14 (4), 1952 (252–8). [F.] O.B.D.

Describes two new species of *Lithocarpus*.

3108. KOSTECKA-MĄDALSKA, O. Buk wschodni (*Fagus orientalis* Lipsky), nowy składnik parków polskich i analiza jego cech rozpoznawczych. **[*F. orientalis*, a new constituent of Polish parks, and an analysis of its diagnostic features.]** *Roczn. dendrol. polsk. Tow. bot., Warsz.* 8, 1952 (113–34). 12 refs. [Pol.pol.russ.e.]

Observations on 4 specimens of *F. orientalis* in a Wrocław park show that: (1) the modal value of the number of lateral nerves from leaves of short shoots of low, sterile branches often exceeds 10 and even reaches 15; (2) specimens of *Fagus* having 13 or more lateral nerves should be included in *F. orientalis*; (3) those with fewer, cannot be determined as *F. orientalis* without examination of the cupules; (4) *F. orientalis* seems to have in most cases a longitudinally furrowed stem; (5) typical specimens of *F. orientalis* shed their leaves earlier than *F. sylvatica*. [Cf. *For. Abstr.* 9 (No. 120); 13 (No. 2816).]

3109. STEENIS, C. G. G. J. VAN. **Preliminary account of Papuan *Nothofagus*.** *Blumea* 7 (1), 1952 (146–7). [E.] O.R.S.

Briefly describes 16 species.

3110. PELLEGRIN, F. Les Flacourtiacées du Gabon. **[The Flacourtiaceae of Gabon.]** *Mém. Soc. bot. France* 1952 (105–21). [F.] O.B.D.

3111. DUMAZ-LE-GRAND, N. Contribution à l'étude des Légumineuses de Madagascar. IV. Les genres *Xanthocercis* H. Bu. et *Pseudocadia* Harms. **[Contribution to the study of the Leguminosae of Madagascar. IV. The genera *Xanthocercis* and *Pseudocadia*].** *Bull. Soc. bot. France* 99 (7/9), 1952 (313–5). 8 refs. [F.] O.B.D.

3112. JOVET, P. *Nuxia humberti*, spec. nov., Loganiacée nouvelle de Madagascar. Description et considérations sur l'évolution de l'inflorescence des *Nuxia*. **[*N. humberti* sp. nov. (Loganiaceae) from Madagascar. Description and notes on the evolution of the inflorescence of *Nuxia*.]** *Phanérogamie* 14 (4), 1952 (281–8). 3 refs. [F.f.] O.B.D.

3113. DUVIGNEAUD, P. Aperçu sur les sections africaines du genre *Strychnos* (Loganiaceae). **[The African sections of the genus *Strychnos*.]** *Bull. Soc. Bot. Belg.* 85 (1), 1952 (9–37). 19 refs. [F.] O.B.D.

3114. HOCHREUTINER, B. P. G. *Macrostelia*, un nouveau genre extraordinaire de Malvacées de Madagascar. [***Macrostelia*, a new and unusual genus of Malvaceae from Madagascar.**] *Phanérogamie* 14 (4), 1952 (229–34). [F.] O.B.D.

The new genus contains two new woody species from Madagascar, *M. involucrata* and *M. calyculata*. These species have some flowering habits unique in the Malvaceae.

3115. MORLEY, T. **A new genus and three new species in the Memecyleae (Melastomaceae).** *Amer. J. Bot.* 40 (4), 1953 (248–55). 4 refs. O.B.D.

Coryphadenia gen. nov. is erected to cover 3 species formerly placed under *Mouriria*. The genus has representatives in Cuba, French Guiana and western Brazil. A new tree species *C. plerocarpa* from western Amazonian Brazil is described, along with two new species of *Mouriria*.

3116. **Illustrations of the fruits of *Eucalyptus* species with alphabetical and numerical indices (covering 465 species and varieties).** *Leafl. For. Timb. Bur. Aust.* No. 63, 1952. pp. 10 + 16 plates.

Contains a table giving alphabetically 465 of the 638 species and varieties listed in 'A key to the Eucalypts' by W. F. Blakely, 1934, a table of the same species arranged in numerical sequence by Blakely's index numbers, 8 plates of illustrations of the fruits and 8 of the buds of each species (all natural size) based on the plates in 'A critical revision of the genus *Eucalyptus*' by J. H. Maiden but according to Blakely's nomenclature.

3117. GARDNER, C. A. **Trees of Western Australia: 13. The Coral-Flowered Gum (*Eucalyptus torquata* Luehm). 14. The Lemon-Flowered Gum (*Eucalyptus woodwardii* (Maiden). 15. The White Mallee (*Eucalyptus erythronema*).** *Leafl. Dep. Agric. W. Aust.* No. 2029, 1953. pp. 8. (*Repr.* from *Journal of Agriculture of Western Australia* Vol. 2 (3rd ser.) Jan./Feb. 1953).

Botanical descriptions.

3118. GREGSON, E. J. **Eucalypts of Mt. Wilson and Mt. Irvine, N.S.W.** *Victorian Naturalist, Melbourne* 68 (10), 1952 (165–71). 10 refs. O.R.S.

Describes briefly and discusses the uses of 20 *Eucalyptus* species and 3 hybrids and *Angophora costata* and *A. intermedia*, giving details of their distribution in the area.

3119. CHEVALIER, A. Les jujubiers ou *Ziziphus* du Sahara. [***Zizyphus* spp. of the Sahara.**] *Rev. int. Bot. appl. Agric. trop.* 32 (361/362), 1952 (574–7). [F.] P.R.

Describes briefly *Z. nummularia*, *Z. spina-christi* and *Z. mauritiana*, and discusses the ecology of *Z. lotus* and *Z. mauritiana* subsp. *orthacantha*.

3120. PELLEGRIN, F. Les Rhizophoracées de l'Afrique Équatoriale Française. [**The Rhizophoraceae of French Equatorial Africa.**] *Phanérogamie* 14 (4), 1952 (292–300). [F.] O.B.D.

3121. DUVIGNEAUD, P., and DEWIT, J. Les 'Mufungu' (*Anisophyllea*) des steppes et forêts claires du Congo méridional. [**The 'Mufungu' (*Anisophyllea*) of the steppes and open forests of the Southern Congo.**] *Bulletin des Séances de l'Institut Royal Colonial Belge, Bruxelles* 21 (4), 1950 (918–45). 5 refs. [F.] L.S.

With a key to the species.

3122. ARÈNES, J. Révision du genre *Macarisia* Thou (Rhizophoracées). [**Revision of the genus *Macarisia*.**] *Phanérogamie* 14 (4), 1952 (248–52). [F.] O.B.D.

With key. Three new species are described—*M. capuronii*, *ellipticifolia* and *humbertiana*.

3123. SMITH, A. C. **Studies of Pacific Island plants, XVI. Notes on Fijian Rubiaceae.** *J. Arnold Arbor.* 34 (2), 1953 (97–124).

Includes descriptions of *Gardenia candida* sp. nov., and several new species of *Ixora* and *Psychotria*.

3124. GAGNEPAIN, F. Sabiacées nouvelles d'Indochine (*Sabia* et *Meliosma*). [**New Sabiaceae from Indo-China (*Sabia* and *Meliosma*).**] *Phanérogamie* 14 (4), 1952 (271–6). [F.] O.B.D.

3125. KOBENDZA, R. Topole sekcji *Leuce* Duby w Polsce. [**Poplars of the section *Leuce* in Poland.**] *Roczn. dendrol. polsk. Tow. bot., Warsz.* 8, 1952 (32–98). 2 refs. [Pol.russ.e.]

Results of study of morphological variation especially in the shape of short-shoot leaves, in *Populus tremula* (I), *P. alba* (II), and *P. canescens* (III), all of them growing wild in the Vistula valley. Four main types of leaf-shape have been distinguished in I, 6 in II, and 5 in III.

3126. JEVKEN, M.; LAM, H. J., and ROYEN, P. VAN; ROYEN, P. VAN. **Revision of the Sapotaceae of the Malaysian area in a wider sense. I. A monograph of the genus *Isonandra*. II. *Burckella* Pierre. III. *Mimusops*.** *Blumea* 6 (3), 1952 (547–95). [E.] O.R.S.

3127. LAM, H. J., and ROYEN, P. VAN. **Concise revision of the Sarcospermataceae.** *Blumea* 7 (1), 1952 (148–53). [E.] O.R.S.

Briefly describes 8 species.

3128. SMITINAND, T. ***Dichroa febrifuga* Lour.** *Vanasarn* 10 (3), 1952 (66–9). [Siam.e.]

Brief account of the rediscovery of this species by the staffs of the Botanic and Zoological Section, Forest Products Research Division, Bangkok, in rain forest at Khao Luang, Kirewong and Nakawn Sritamarat.

3129. KOBUSKI, C. E. **Studies in the Theaceae, XXVII. Miscellaneous new species in Theaceae.** *J. Arnold Arbor.* 34 (2), 1953 (125–37).

New trees described are several species of *Adinandra*, *Eurya pseudocerasifera*, and *Freziera cuatrecasasii*.

3130. CAPURON, R. Identité de genres *Nesogordonia* H. Bn et *Cistanthera* K. Schum. et description de deux espèces nouvelles de Madagascar. [**Identity of *Nesogordonia* and *Cistanthera* and a description of two new species from Madagascar.**] *Phanérogamie* 14 (4), 1952 (258–63). [F.] O.B.D.

Nesogordonia antedates *Cistanthera*. The necessary new combinations are made, and descriptions are given of *N. humbertii* and *N. normandi* spp. nov.

3131. SILLANS, R. Matériaux pour la flore de l'Oubangi-Chari (Ulmacées). [**Contribution to the**

flora of Ubangi-Shari (Ulmaceae).] *Mém. Soc. bot. France* 1952 (100–4). [F.] O.B.D.

Brief descriptions of species of *Celtis*, *Trema* and *Chaetacme*.

3132. Leroy, J.-F. La conception synthétique de l'espèce: étude morphologique et biogéographique sur un groupe de *Celtis* de la section *Solenostigma* (Ulmacées-Celtidoïdées). [**The synthetic conception of the species: a morphological and biogeographical study of a group of *Celtis* of the section *Solenostigma*.**] *Bulletin de l'Institut Français d'Afrique Noire, Dakar* 10, 1948 [1951?] (212–34). 26 refs. [F.]

3133. Moldenke, H. N. **Notes on new and noteworthy plants. XV.** *Phytologia* 4 (3), 1953 (173–84). A.P.B.

Among new forms and varieties the following new tree species are described: *Aegiphila purpurascens* from Ecuador, and *Premna congolensis* from the Belgian Congo.

18. PLANT ECOLOGY

181. *Mode of Life, Autecology. Silvicultural Characters of Trees*

See also No. 3084.

3134. Fourchy, P. Études sur l'écologie et la sylviculture du mélèze (*Larix europaea* D.C.)—1. Écologie du mélèze particulièrement dans les Alpes françaises. [**Studies in the ecology and silviculture of *Larix decidua*. 1. Ecology of Larch, particularly in the French Alps.**] *Ann. Éc. Eaux For. Nancy* 13 (1), 1952 (1953), (1–132 + 3 maps + 18 photos). 92 refs. [F.f.g.e.]

Contains the following chapters: (1) The distribution and range of Larch in Europe with special reference to the French Alps. (2) Ecological factors: (*a*) climatic, (*b*) edaphic, (*c*) genetic, (*d*) biotic. (3) Silvicultural questions (mainly on the possibility of regenerating Larch stands). The author's recommendations are based on the hypothesis that Larch is a pioneer or 'crisis' species, whose regeneration requires heavy cutting in the old stand, elimination of competing species, and scarification of the soil.

3135. Duchaufour, P. Études sur l'écologie et la sylviculture du mélèze (*Larix europaea* D.C.)—2. Pédologie et facteurs biotiques. [**Studies in the ecology and silviculture of *Larix decidua*. 2. Pedology and biotic factors.**] *Ann. Éc. Eaux For. Nancy* 13 (1), 1952 (1953), (135–203 + 4 photos). 92 refs. [F.f.g.e.]

A study in three main parts: (1) the soils and vegetation of the different types of Larch stand; (2) the evolution of the soils and vegetation in high montane Larch stands; and (3) practical applications. Four types of soil and vegetation are distinguished in Larch stands at high altitudes: (*a*) skeletal soils partially occupied by pioneer species; (*b*) immature brown earths, on sloping sites, characterized by grass mixed with scattered species progressing either to heath (siliceous soil) or to shrub formation (calcareous soil); (*c*) mature brown earths on flat or gently sloping sites, usually heavily grazed and characterized by dense grass sward; and (*d*) podzols occupied by old heath (*Rhododendron*/*Vaccinium*). Larch regenerates naturally on (*a*), and often on (*b*) provided that competition from grass and shrubs is not intense. Natural regeneration does not occur on (*c*) or (*d*).

3136. Elbir, N. Ormanlarımızda Taxus Baggata (Porsuk) [***Taxus baccata* in our forests.**] *Orman ve Av* 24 (12), 1952 (304–5). [Turk.]

Short account of distribution and ecology in Turkey, with height (up to 30 m.) and thickness (up to 450 cm. girth) of 6 notable specimens measured.

3137. Brown, J. M. B. **Studies on British Beechwoods.** *Bull. For. Comm., Lond.* No. 20, 1953. pp. 100 + 26 photos + 2 drawings. 67 refs. Price 12*s.* 6*d.*

This bulletin presents the results of a comprehensive survey of British Beechwoods carried out during 1948–50. It contains the following chapters: (1) History of Beech in Britain. (2) Notes on systematy, phenology and distribution. (3) Methods used in survey of British Beechwoods. (4) Ecological classification of British Beechwoods. (5) Review of site factors in relation to the growth of Beech. (6) Height growth of young Beech crops. (7) Silvicultural notes. (8) Problems of establishment. (9) Stem form of Beech, with particular reference to environment. (10) Insects and fungi associated with Beech. (11) Some vertebrates of importance in Beechwoods. (12) The flora of Beechwoods. (13) Action of Beech on the soil [cf. *For. Abstr.* 14 (Nos. 3157–9)]. (14) The future of Beech in Britain. The increment data derived from examination of a number of Beechwoods are presented in a series of tables and graphs.

3138. Koelmeyer, K. O. **Silvicultural notes on trees—Halmilla.** *Ceylon Forester* (*n.s.*) 1 (1), 1953 (35–8).

Silvicultural characters of *Berrya cordifolia*.

3139. Métro, A. Note forestière sur l'*Eucalyptus sideroxylon*. [**A note on *E. sideroxylon*.**] *Ann. Rech. for. Maroc 1951*, 1952 (3–23 + 4 photos). 18 refs. [F.]

Botanical description, silvicultural characters, natural range in Australia, acclimatization in the Mediterranean area, increment and yield of plantations in Morocco, wood properties, and tannin content of bark.

3140. Sanders, M. **Notes on Nigerian high forest species.** *Inform. Bull. For. Dep. Nigeria* No. 7, 1953. pp. 8.

Notes on general distribution, flowering and fruiting, silvicultural characters, regeneration, and rate of growth of, and volume tables for, *Khaya ivorensis*.

3141. Sanders, M. **Notes on Nigerian high forest species: *Lovoa klaineana*, Pierre ex Sprague, African Walnut.** *Inform. Bull. For. Dep. Nigeria* No. 9, 1953. pp. 8.

Describes distribution, flowering and fruiting, silvicultural characters, natural and artificial regeneration and rate of growth, and gives some volume tables.

181.1. Distribution, Natural Range

See also No. 3147.

3142. MOLDENKE, H. N. **The known geographic distribution of members of the Verbenaceae, Avicenniaceae, Stilbaceae, Symphoremaceae, and Eriocaulaceae. Supplement 6.** *Phytologia* 4 (3), 1953 (184–200). 9 refs. A.P.B.

3143. OLLINMAA, P. J. Jalot lehtipuumme luontaisina ja viljeltyinä. **[Natural range and limits of cultivation of some broadleaved southern species in Finland.]** *Silva fenn.* No. 77, 1952. pp. 73. 112 refs. [Fi.e.]

Discusses the natural range and northern limits of cultivation in Finland of *Quercus robur*, *Fraxinus excelsior*, *Acer platanoides*, *Tilia cordata*, *Ulmus scabra* and *Ulmus laevis*.

3144. DAYTON, W. A. **Geography of commercially important United States trees.** *J. For.* 51 (4), 1953 (276–9).

Lists 152 species, primarily of value for their wood, showing their distribution: in the Pacific states only; W. of 100th meridian but not confined to the Pacific states; E. of the Mississippi river only; E. of the 100th meridian but not confined to E. of the Mississippi; and widely throughout the U.S.A.; and shows the number and % of commercially important species found in each of these 5 regions.

3145. HAYASHI, Y. **[The natural distribution of important trees indigenous to Japan. Conifers, report 2.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 55, 1952. pp. 251 + 38 photos. Many refs. [Jap.e.]

Discusses the distribution, habitat, regeneration, wood properties and uses of *Torreya nucifera*, *Podocarpus macrophylla*, *Picea bicolor* and its varieties *acicularis* and *reflexa*, *P. jezoensis* var. *hondoensis*, *P. koyamai*, *P. maximowiczii* and *P. polita*, *Pseudotsuga japonica*, *Pinus densiflora*, *P. koraiensis* and *P. thunbergii*, *Thuja standishii*, *Thujopsis dolabrata* and *T. dolabrata* var. *hondai*. [Cf. *For. Abstr.* 13 (No. 1018).]

3146. HAYASHI, Y. **[The natural distribution of important trees indigenous to Japan. Conifers, report 2.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 55, 1952.

Sixteen maps, with English legends, illustrating the report. [See preceding abstract.]

181.2. Atmospheric Relations. Acclimatization

See also Nos. 2976, 3167, 3177, 3181, 3252 *et seq.*, 3323–5.

3147. KATÔ, R. **[An ecological explanation of the southern range of *Abies mayriana* and *Picea jezoensis* in Hokkaido.]** *Bull. Tokyo Univ. For.* No. 41, 1951 (33–41). 25 refs. [Jap.e.]

T. Kira used the 'indices of cumulative temperature', the 'indices of warmth' and the 'indices of coolness', based on the total amount of the monthly mean temperature above or below 5° C., in determining the limit of distribution of warm-temperate and temperate forest in Japan, but was unable to trace a clear relationship between the indices of accumulated temperature and the northern limit of temperate deciduous forest or the southern limit of northern coniferous forest in Hokkaido. In view of the apparent significance of an air temperature of 0° C. in the seasonal change of osmotic pressure of the cell sap of northern conifers, the author adopted this as a standard for calculating the indices of accumulated temperature. Results are shown in maps, comparing the lines of indices of warmth and coolness with distribution of species. The lines of the index of warmth 110°, and of the index of coolness − 20° are shown to coincide with the southern range of *A. mayriana* and those of 100° and − 10° with the southern range of *P. jezoensis*. No close relationship was found between temperature index lines and the northern range of *Fagus crenata*, a typical species of temperate deciduous forest. *Castanea crenata*, however, which also belongs to the temperate deciduous forest, is not found beyond the distribution line of the index of warmth for 100°. The author considers that the line for 100° is suitable as indicating the boundary between temperate deciduous forest and northern coniferous forest in Hokkaido, and that the zone lying between the index of warmth for 110 and for 100° is a transitional zone between these two forest types. *From author's summary.*

3148. GAUSSEN, H. Les résineux d'Afrique du Nord. Écologie, reboisements. **[The softwoods of N. Africa. Ecology and afforestation.]** *Rev. int. Bot. appl. Agric. trop.* 32 (361/362), 1952 (505–32). [F.] P.R.

Discusses the native softwoods, allotting to each a formula of ecological requirements, based on: (1) temperature, with factors ranging from t_1, where mean temperature of the warmest month is less than + 10° C., to t_6, yearly average over 30°; (2) humidity, factors ranging from S_1, total annual precipitation over 2000 mm., to S_6, total below 100 mm.; (3) a xerothermic index, ranging from x, with 0–40 dry days, to x_6 with over 300 dry days annually, where dry days are counted as those without rainfall or with low air humidity in consecutive dry months, viz. months with rainfall values ranging from 10 to 75 mm. linked with a series of mean temperatures ranging from < 10 to $> 30°$; (4) the duration of the growing season (V, growing season less than 6 months, V_2 6–9 months, $V_{2/3}$ tropical climate with two dry seasons causing a distinct check in growth, and V_3 continuous growth); and (5) soil factor (calcareous, sandy, or of no great importance). Also describes briefly and discusses the climatic requirements and possible value for afforestation of a number of exotic softwoods.

3149. SCHMIDT, W. Wärmeklima und Ökotypus. **[Temperature in the climate and the formation of ecotypes.]** *Ber. dtsch. bot. Ges.* 66 (2), 1953 (101–13). 21 refs. [G.g.] O.B.D.

Discusses the relationship between the start of the growing season and the time of year when an average daily temperature of 5° C. is reached. The length of time during which an average daily temperature of 5° and over may be expected is an important climatic factor and plays a large part in influencing the formation of ecotypes, particularly with reference to the optimum temperature for germination, the beginning and end of the growing

season, % of dry matter in winter, photoperiodic reactions, phototropism, and branch habit.

3150. WILNER, J. **A study of desiccation in relation to winter injury.** *Sci. Agric.* 32 (12), 1952 (651–8). 9 refs. [Forest Nursery Station, Indian Head, Sask.] O.R.E.

A study was made of the relative effects of temperatures above and below freezing on the extent of desiccation of 1-year-old mature twigs of *Caragana arborescens*, *Fraxinus pennsylvanica* var. *lanceolata*, *Ulmus americana*, *Acer negundo* and *Populus deltoides* during the winters of 1950 and 1951. Some of the twigs were exposed on outdoor drying racks, and others were left attached to the tree. Throughout both winters the water content of these species was not greatly affected during periods with temperatures below freezing point. Desiccation of twigs exposed on outdoor drying racks occurred mainly during periods with temperatures above freezing point, especially above 41° F. During these milder periods greater increases in water content were found in all twigs taken from trees in the field, which suggests that water had been conducted into twigs to overcome any water loss that had occurred. Except in Ash, however, the amount of water conducted in excess of the losses was less than the amount lost by twigs on the rack. During the mild spells, of the species tested, the Ash lost the least moisture on the drying rack and gained the most in the field. This indicates that Ash would probably be suitable for the chinook areas of the prairies. The mature twigs of Ash had the lowest moisture content of the selected trees at the beginning of the study, and did not suffer any killing on drying racks or on trees in the field during the 105-day period of outdoor winter exposure. This indicates a possible association between greater maturity and higher winter survival. The desiccating effects of mild spells in winter resulted in greater injury to woody twigs exposed on a drying rack than the extreme low temperatures that prevailed during the period of study. The desiccation injury, however, was not apparent on twigs that remained attached to trees since these were able to restore, in part, the moisture loss shown by twigs on the drying rack. [Cf. *For. Abstr.* 14 (No. 2006).] *From author's summary.*

3151. KOBENDZA, R. Modrzew chiński złocisty *Pseudolarix amabilis* Rehd. (Syn. *P. kaempferi* Gordon, *P. fortunei* Mayr, *Larix amabilis* Nelson). [***P. amabilis.***] *Roczn. dendrol. polsk. Tow. bot., Warsz.* 8, 1952 (225–8). [Pol.russ.e.]

Describes several specimens of *P. amabilis* grown in Poland, and stresses the possibility of acclimatization of this species.

181.3. Water, Soil and Root Relations (including Bacterial and Mycorrhizal Symbiosis)

See also Nos. 2982–3, 2985–6, 2993, 3148, 3169, 3184–6, 3189, 3340, 3351, 3459–61.

3152. SHIPMAN, R. D. **A silvical study of certain factors contributing to the differential height growth of plantation-grown Tulip Poplar [*Liriodendron tulipifera*].** *Abstr. of thesis*, in *J. For.* 51 (2), 1953 (128–9).

The continuous soil-moisture regimen throughout the growing season was found to be the principal limiting factor contributing to the marked differential height growth of plantation-grown *L. tulipifera*.

3153. STOECKELER, J. H. **Alkali tolerance of drought-hardy trees and shrubs in the seed and seedling stage.** *Proceedings of the Minnesota Academy of Science, Minneapolis* No. 14, 1946 (79–83). L.S.

To test the relative alkali tolerance of various species, seed or recently germinated seedlings were placed in solutions of Na_2SO_4 and Na_2CO_3 of various concentrations, and the ability of the seed to germinate or elongate the hypocotyl was observed. The species tested were those usually planted in the Great Plains for shelterbelts and farm windbreaks. Alkali tolerance was greatest in *Elaeagnus angustifolia*, *Chilopsis linearis*, *Gleditsia triacanthos*, *Ulmus pumila*, *Fraxinus pennsylvanica* var. *lanceolata*, *Morus alba* var. *tatarica* and *Caragana arborescens*. Na_2CO_3 proved 3–4 times more toxic than Na_2SO_4. Ungerminated seed tolerated more alkali than seeds that had already been sprouting for about 5 days. In tests on *Juniperus scopulorum* the alkalis had the following decreasing order of toxicity: $NaHCO_3$, Na_2CO_3, $MgSO_4$, NaCl, $MgCl_2$, Na_2SO_4. Small quantities of Ca added in the form of $CaSO_4$ more than doubled the alkali tolerance.

3154. SAVORY, H. J. **A note on the ecology of *Rhizophora* in Nigeria.** *Kew Bull.* 1953 (1), (127–8).

Notes on the distribution of *R. harrisonii*, *R. racemosa* and *R. mangle*, which appears to be influenced by the salt tolerance of the individual species.

3155. POLEDICA, D. V., and STANKEVIĆ, P. Pedološki nalaz pod Pančićevom omorikom (*Picea omorica* Panč.) na Tari. [**Study of the soil under *P. omorika* at Tara.**] *Rad. Inst. nauč. Istraž. šum., Beograd* No. 1, 1950 (122–8). 6 refs. [Serb.f.]

The site described appears to be the optimum for *P. omorika*. The terrain is hilly, with N.E. to N.W. exposures. Precipitation varies between 1000 and 1200 mm. p.a. The atmosphere is humid, with frequent fogs. The soil, developed over limestone, is a rendzina, shallow, porous, moist, and rich in humus. The pH of the top 15 cm. of soil is 6·15 in H_2O and 5·48 in *N*KCl. The humus is acid. In the lower soil layers, however, acidity diminishes rapidly, the corresponding pH values for the 15– to 35– cm. layer being 7·21 and 6·66.

3156. RICHARD, F. Physikalische Bodeneigenschaften natürlich gelagerter Rissmoränewaldböden unter verschiedener Bestockung. [**Physical properties of forest soils of the Rissian moraine, with undisturbed horizons, under various types of stand.**] *Schweiz. Z. Forstw.* 104 (4/5), 1953 (154–73). 12 refs. [G.f.]

Comparison was made of number and size of pores in several horizons under (1) 200-year-old Oak (not previously cultivated), (2) 60- to 70-year old Spruce (after agricultural use), and (3) 130-year-old Silver Fir (not previously cultivated). The results

showed that the Oak had had a very beneficial effect at all depths, while the Spruce and Fir soils were very poorly provided with large pores and were consequently less well drained.

3157. Poledica, D. V. Prilog proučavanju šumskog zemljišta. **[Contribution to the study of forest soils.]** *Rad. Inst. nauč. Istraž. šum., Beograd* No. 1, 1950 (110–21). 11 refs. [Serb.f.]

Reports the results of investigations into the influence of different species on the fertility of forest soils. The stands studied—pure and mixed stands of *Abies alba*, *Picea abies*, *Pinus sylvestris* and *Fagus sylvatica* in the Tara and Sargan forests—are situated on soils over limestone. Annual rainfall varies between 1000 and 1200 mm. The stands have arisen from natural regeneration and are between 30 and 150 years old. Data are presented on: pore space and absolute moisture and air capacity (using a modification of Kopecky's method); humus %; pH values; readily available P_2O_5 and K_2O, and total N in the soil. The results confirm that mixed stands preserve and increase soil fertility. Average pH values, in H_2O and in *N* KCl respectively, under some of the stands were as follows: pure Beech—6·00, 5·48; Beech (70%)/Silver Fir/Norway Spruce—5·00, 4·19; Beech (80%)/Maple—6·95, 6·05; Beech (90%)/Hornbeam—6·98, 6·02. In all the stands studied, soil acidity increased with increasing density of canopy.

3158. Malquori, A., and Cecconi, S. Sulla stabilità della struttura di alcuni terreni della Sila, in rapporto a differenti piante forestali. **[The structural stability of some soils of the Sila Grande [Calabria] in relation to different forest species.]** *Ital. for. mont.* 8 (1), 1953 (19–21). [It.it.f.]

Presents the results of an evaluation of the water-stability of aggregates (1–2 mm.) taken from forest soils. Though a majority of the aggregates consisted of primary particles, it was possible to distinguish the different effect of organic matter of different provenances on soil cohesion, according to the dominant forest species. This effect was found to increase in intensity in the following order: Chestnut, Beech, Corsican Pine, Oak.

3159. Galoux, A. Le hêtre et la dégradation des sols forestiers loessiques. **[The Beech and degradation of loess forest soils.]** *Bull. Soc. for. Belg.* 60 (5), 1953 (225–35 + 1 photo). [F.]

In order to determine the effect of various vegetation types on brown loess soils, flax was sown (5 seeds/pot) on soil samples from (1) Oak forest with mixture of Hornbeam, Hazel etc., (2) pure Beech, (3) former Beech forest now under Blackberry, *Juncus* sp. etc. Weight of flax/pot after 2 months varied from 47–54 g. for (1) to 0·4–18 g. for (2) and (3). Besides being so much smaller, the plants obtained on (2) and (3) were chlorotic and had undersized flowers. [Cf. *For. Abstr.* 14 (No. 3137).]

3160. Wasjutin, C. Perigos do reflorestamento com árvores exóticas. **[Dangers of reforestation with exotics.]** *An. bras. Econ. flor., Inst. nac. Pinho* 4 (4), 1951 (196–201). [Port.e.]

Sets forth some arguments against the use of Eucalypts and other exotics for afforestation in Brazil. For example, no native flora or fauna flourish in pure Eucalypt stands in Brazil. There is no natural regeneration. A poor, acid type of humus is formed and the soil becomes exhausted. Eucalypts are not suitable for growing in mixture with native species.

3161. Harley, J. L., and McCready, C. C. **The uptake of phosphate by excised mycorrhizal roots of the Beech. III. The effect of the fungal sheath on the availability of phosphate to the core.** *New Phytol.* 51 (3), 1952 (342–8). 4 refs. O.R.S.

(1) The fungal sheath constitutes about 39% of the dry weight of mycorrhizal roots of Beech. (2) Two procedures (dissection and slicing) which expose the cores of mycorrhizae to the external medium, increase their P uptake more than that of the sheath. It is concluded that the sheath of intact mycorrhizae restricts the uptake of P by the cores. This restriction is less at higher than at lower concentrations. (3) The relationship between P absorption by mycorrhizae and external concentration is described. (4) Several lines of evidence indicate that P absorption is linked with metabolic activity over the whole range of P concentration studied. [Cf. *For. Abstr.* 14 (No. 165).] *Authors' summary.*

3162. Harley, J. L., McCready, C. C., and Brierley, J. K. **The uptake of phosphate by excised mycorrhizal roots of the Beech. IV. The effect of oxygen concentration upon host and fungus.** *New Phytol.* 52 (2), 1953 (124–32). 2 refs. O.R.S.

(1) The absorption of phosphate from a 0·161 m. mol. solution by excised Beech mycorrhizae was measured in a range of O concentrations. (2) P and O uptakes rose with O concentration from pure N to ordinary air and appeared proportional to one another at low O concentrations. (3) Observations on intact mycorrhizae and on separated fungal sheaths and host cores showed that absorption by the sheath was sensitive to O concentration over the whole range, whereas that of the core was unaffected between 21 and 1% O. [Cf. *For. Abstr.* 14 (No. 165).] *From authors' summary.*

3163. Harley, J. L., and McCready, C. C. **A note on the effect of sodium azide upon the respiration of Beech mycorrhizas.** *New Phytol.* 52 (1), 1953 (83–5). 2 refs. O.R.S.

Na azide was found to have three effects, not easily related to one another, on mycorrhizal roots of Beech: (1) the significant inhibition of phosphate accumulation at concentrations as low as 0·05 mM; (2) the stimulation of CO_2 production in the presence of O; and (3) the inhibition of CO_2 production in anaerobic conditions.

3164. Uemura, S. **[Studies on root nodules of Alders (*Alnus* spp.). V. Some new methods of isolating *Streptomyces* from Alder nodules.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 57, 1952 (209–26 + 5 photos). 11 refs. [Jap.e.]

Cf. *For. Abstr.* 14 (No. 166).

3165. Miettinen, J. K., and Virtanen, A. I. **Nitrogen metabolism of the Alder (*Alnus*): the absence of arginase and presence of glutamic acid.** *Acta chem. scand.* 7 (2), 1953 (289–96). 16 refs. [E.e.] [Biochemical Institute, Helsinki.] O.R.S.

No arginase activity was found in leaf, root or nodule tissues of *A. incana*. The occurrence of L (+)-glutamic acid decarboxylase in leaf and nodule tissue was investigated and some activity, concentrated mainly in the insoluble cell particles, was noted in summer but very little in autumn when the leaves were falling. In comparative experiments carrot and pea showed greater activity. Utilization of citrulline via the urea circle in the absence of arginase seems unlikely. Formation of γ-aminobutyric acid as a product of glutamic acid decarboxylation is probable, although the activity of the corresponding decarboxylase in the leaf and nodule tissue is weak. *From authors' summary.*

3166. Turunen, J. Huomioita harmaalepän juuristosta ja juuriäkämistä. **[The root system and root nodules of *Alnus incana*.]** *Metsät. Aikak.* 1953 (3/4), (98, 101–4, 110). 8 refs. [Fi.e.]

Eleven complete root systems were dug up in Finland and the main part of another near Basel, Switzerland. Soil moisture appeared to be the factor with most influence on the depth of the root system. On wet and moist soils the root system follows the soil surface, but on drier ground the root ends and, later, entire root branches turn downward. In dry ground the main part of the root system is deep and there may be vertical and oblique root branches at depths of over 1½ m. On wet soil, the root system resembles that of young Spruce; on dry soil it lies at about the same depth as Birch but is more open. Most root nodules are found in moderately good soils, the number decreasing on both better and poorer soils. For 5 trees investigated, the weight of the nodules averaged 11·7% of that of the leaves, and sampling suggests that the % would be similar with a greater amount of material. Most nodules seem to occur in the soil layers containing the main part of the roots. After the lenticels opened in early summer the starch in the nodules decreased, increasing again in late summer when the lenticels closed. *From author's summary.*

3167. Richardson, S. D. **Studies of root growth in *Acer saccharinum* L. I. The relation between root growth and photosynthesis.** *Proc. ned. Akad. Wet.* 56*C* (2), 1953 (185–93 + 3 photos). 3 refs. [E.e.] O.R.S.

One-year seedlings were grown in gravel cultures in glass tubes and the rates of root growth measured by a horizontal microscope. The environmental conditions studied covered a range of light intensities from 200 to 12,000 luxes; a temperature range from 5 to 30° C.; and an atmosphere with and without CO_2. A specially designed thermostatic cabinet for changing the shoot temperature while keeping the root temperature constant is described. Results, given in graphs, show that changes in light, temperature, and presence or absence of CO_2 have an effect on root growth commensurate with that on photosynthesis; the effect starts 12–24 hours after the change. When equilibrium growth rates are plotted against light intensity and shoot temperature respectively the resulting curves closely resemble photosynthesis curves. [Cf. *For. Abstr.* 13 (No. 3582).]

3168. Kurz, H., and Wagner, K. **The role of adventitious roots in survival of Cypress.** *Abstr.* in *Journal of the Tennessee Academy of Science, Nashville* 27 (3), 1952 (201). L.S.

The sudden submergence of Cypress [*Taxodium* sp.] by earthquakes in 1811 and 1812 in Reelfoot Lake, Tennessee, caused the formation of a new buttress and adventitious roots at the new waterline, the trunk below the secondary buttress having died.

181.4. Reaction to Biotic Influences (Competition etc.) and Fire

See also Nos. 3182, 3185–6, 3242–4, 3346.

3169. Schmid, H., and Zeidler, H. Beobachtungen und Gedanken zum Rückgang der Tanne. **[Observations on the decline of Silver Fir.]** *Forstwiss. Cbl.* 72 (3/4), 1953 (101–10). 15 refs. [G.]

The decline of Fir in the *Abieto-Fagetum*, the optimum association for central European montane sites, is attributed to the widespread introduction of Spruce. In a Spruce/Fir community, less water reaches the soil than in Beech/Fir, and still less penetrates to the mineral soil. The deeper-rooted Fir, coming into competition with the Spruce, is deprived of water, and reduces its transpiring surface through needle-fall, with a consequent retardation of growth. These factors also affect adversely the naturally regenerating Fir, which comes into immediate root competition with the Spruce and often with invading *Festuca altissima*. At lower altitudes (below 500 m.) the same disadvantages are not always met, since here the feeding roots of the Fir often occur at the same level as those of the Spruce. [Cf. *For. Abstr.* 14 (Nos. 3185–6).]

3170. Place, I. C. M. **The influence of bracken fern on establishment of Spruce and Fir seedlings.** *Silv. Leafl. For. Br. Can.* No. 70, 1953. pp. 4. 4 refs.

On both a fresh and a wet Red Spruce/Balsam Fir site, dense growth of *Pteridium aquilinum* appeared to be detrimental to the germination and early survival of Spruce and Fir seedlings.

181.5. Reproductive Behaviour

See also Nos. 2981, 3037, 3043, 3055, 3153, 3170, 3192, 3241 *et seq.*

3171. Duffield, J. W. **Pine pollen collection dates—annual and geographic variation.** *For. Res. Note Calif. For. Range Exp. Sta.* No. 85, 1953. pp. 9.

Includes a revised table [cf. *For. Abstr.* 9 (No. 1458)] of dates of pollen collection at different places for some 70 species, varieties and hybrids.

3172. Tihomirov, B. A. Dannye o zanose pylcy drevesnyh porod k severu ot lesnoï granicy. **[Data on the transport of pollen of woody species to the north of the forest limit.]** *Dokl. Akad. Nauk SSSR* 71 (4), 1950 (753–5). 9 refs. [Russ.] A.P.B.

Shows that tree pollen is transported for considerable distances into the tundra zone, and urges the necessity of making appropriate allowances when interpreting the pollen spectra of peat bogs etc. in this region.

3173. Hyde, H. A. **Studies in atmospheric pollen. V. A daily census of pollens at Cardiff for the**

six years 1943–8. *New Phytol.* 51 (3), 1952 (281–93). 8 refs. O.R.S.

Variations in the size of annual catches of pollen from different species are shown to be due mainly to pollen productivity. This, in vernal and prevernal trees, appears to be correlated to some extent with the weather during the late summer of the previous year. Certain trees, notably Oak, Ash and perhaps Elm, show a cyclic variation (5, 3 and 3 years) in flowering activity, largely independent of weather during the formative period. Birch and Beech appear to follow 2-year flowering cycles. Practical applications of this knowledge are discussed. [Cf. *For. Abstr.* 13 (No. 1045).]

3174. **[Pollination of *Araucaria cunninghamii*.]** *Rep. Dir. For. Qd. 1951/52*, 1952 (8).

Observations during a further general flowering confirmed those made previously [cf. *For. Abstr.* 13 (No. 3689)]. Production of ♂ amenta was generally in stands of 25 years or over. In plantations, ♀ cones were confined to the topmost whorls but in open-grown trees they appeared well down in the crown.

3175. Melle, P. J. van. **Monoecism in *Juniperus scopulorum*.** *Phytologia* 4 (3), 1953 (172). A.P.B.

An amendment to a previous article. [Cf. *For. Abstr.* 14 (No. 123).]

3176. Seitz, F. W. Weitere Beobachtungen am zwittrigen Aspenklon von Dillingen (Donau). **[Further observations on the androgynous Aspen clone from Dillingen (Donau).]** *Abstr.* in *Z. Forstgenet.* 2 (1), 1952 (22). [G.]

A further report [cf. *For. Abstr.* 13 (No. 3687)]. At least some of the androgynous flowers of the clone appear to develop normally. Some cytological aspects are commented on.

3177. Opsahl, W. Om sambandet mellom sommertemperatur og frømodning hos gran. **[The relationship between summer temperature and seed ripening of Norway Spruce.]** *Medd. norske Skogforsøksv.* 11 (3) (No. 40), 1952 (619–62). 22 refs. [Nor.e.]

Summarizes the results of investigations on 58 seed samples collected in 1942, 10 in 1937 and 10 collected in the years 1934, 1936, 1938 and 1940 from Telemark, Østland and Trøndelag. Each sample contained seeds from at least 3 trees. The % of viable seeds, excluding empty seeds, was used as the measure of seed quality. Results, shown in graphs and tables with English and Norwegian legends, include the following: (1) A total, from time of flowering, of 280–300 'growth units' is required (a growth unit is defined as the heat effect obtained when the mean of the 6 warmest hours of the day is 8° C.) before well-ripened seeds with 80–90% germination are obtained. (2) A mean temperature from June to September of about 10° appears to be required to ripen seeds. (3) In the lowlands of the southernmost part of Norway, Spruce seed will generally be fully viable by mid-August even in cold summers, and temperature from June to August is a safe basis for judging seed maturity; as a rule seeds will be ripe when the mean temperature from June to August reaches 11° or when the total of growth units from flowering to 1 Sept. has reached 240. (4) In Trøndelag a very hot summer may give ripened seeds by the middle of August; germination and other qualities improve slightly with delayed harvesting, reaching a maximum about 1 Oct., but the difference between 15 Aug. and 15 Oct. is not large. (5) In Trøndelag, even in an exceptionally hot summer, Spruce cones did not open until October, and normally the harvest may be postponed until felling has been done, and may be continued through the winter. (6) In the southern part of S. Norway the cones generally open in autumn, sometimes as early as September. As they do not open until growth units have reached a total of 400, the cone harvest may be deferred 2–3 weeks beyond the date when the growth units have reached 300. (7) The correlation is closer between growth units than between mean temperature and the % of viable seeds.

3178. Kaufman, C. M., and Posey, H. G. **Production and quality of Pond Pine seed in a pocosin area of North Carolina.** *J. For.* 51 (4), 1953 (280–2).

Seeds from 71 trees of *Pinus rigida* var. *serotina* ranging in age from below 10 to over 60 years at breast height were collected in the dormant season of 1948–9. Young trees had only a small % of open cones, but more than ¼ of the cones on the oldest trees were open. Opening of cones was stimulated by fire at any season and by felling on hot summer days. Few sound closed cones older than 5 years were found on the sample trees, but open cones persisted for 10 years or more. Production of cones increased from about 8/tree for trees below 10 years at b.h. to 175–200/tree at over 30 years at b.h. The number of seeds/cone averaged 78·7. A positive linear relationship was found between age of cone and weight of seed irrespective of quality of seed years. Average weight of 100 seeds was 892·70 mg. or 50,817/lb. based on 275 individual 100-seed lots. The average germination after 60 days was 43·9%. Germination % increased with seed weight, ranging from 29% for seeds weighing 501–600 mg. to 65·3% for seeds weighing over 1200 mg./100 seeds.

3179. Ferré, Y. de. Les formes de jeunesse des Abiétacées: ontogénie—phylogénie. **[Juvenile forms of the Abietineae: ontogeny and phylogeny.]** *Trav. Lab. for. Toulouse* t.2, vol. 3, art. 1, 1952. pp. 282. 19 pages of refs. [F.]

Data on more than 100 species belonging to 9 genera are tabulated. [Cf. *For. Abstr.* 14 (No. 1050).]

3180. Bormann, F. H. **Factors determining the role of Loblolly Pine and Sweetgum in early upland oil-field succession in the Piedmont of North Carolina.** *Abstr.* in *Bull. ecol. Soc. Amer.* 33 (3), 1952 (61–2). A.P.B.

Pinus taeda is better adapted than *Liquidambar styraciflua* to old-field conditions, because of (1) the ability of the germinating seed and seedlings under 1 year old to withstand drought, and (2) its ability to withstand conditions on bare or sparsely covered areas during the first growing season.

3181. McDermott, R. E. **Light as a factor in the germination of some bottomland hardwood seeds.** *J. For.* 51 (3), 1953 (203–4). 4 refs.

Laboratory tests showed that *Betula nigra*, *Platanus occidentalis* and *Ulmus americana* germinate much quicker in light than in darkness. *Acer rubrum*, *U. alata* and *Alnus rugosa* are much less responsive to light. [Cf. *For. Abstr.* 13 (No. 2059); 14 (No. 3292).]

3182. DenUyl, D. **Growth and development of hardwood seedlings.** *Proc. Indiana Acad. Sci.* 61, 1951 (1952), (81–9). 1 ref. A.P.B.

Presents records from plots established in some of Indiana's classified and protected hardwood stands to study regeneration after the exclusion of livestock. Annual measurements were made from 1931 to 1940, and periodic measurements from 1941 to 1950. A study of the results brings out the following facts: (1) Natural regeneration is slow, many seedlings making little height growth during the early period of growth. (2) Reproduction takes place periodically, and environmental factors work to favour one species and not another. (3) The early invaders of the protected stands are not necessarily those that will constitute the stands of the future. (4) The composition of the reproduction below 6 in. in height often varies considerably from year to year. (5) Seed production, dissemination and establishment, and growth of tree seedlings, are cyclic and the whole process is influenced by local site conditions, each quadrat showing a distinct pattern of growth and development.

3183. Petrov, V. V. Intensivnostj otmiranija vshodov nekotoryh drevesnyh porod pod pologom dubravy. [**Mortality rate of seedlings of certain tree species under the canopy of mixed Oak woods.**] *Dokl. Akad. Nauk SSSR* 88 (5), 1953 (925–7). 2 refs. [Russ.] A.P.B.

Tabulates some figures from counts made at intervals between early June and mid-Sept. 1952 on plots under 160- to 200-year-old Oak stands (density of main canopy 0·5–0·6, of second storey 0·2) in three compartments of the Tellerman forest, S. Voronezh. Seedling mortality of the associates of Oak during this period was lowest for Norway Maple (4%), followed by Field Maple (16%), Ash (18%) and Lime (46%). There were no Oak seedlings of the year. Animals, chiefly rodents, were responsible for 40–56% of seedling losses of the first two and the last species, but for only 19% of the losses in Ash.

3184. Richardson, S. D. **A note on some differences in root-hair formation between seedlings of Sycamore and American Oak.** *New Phytol.* 52 (1), 1953 (80–2). 8 refs. O.R.S.

Seedlings of *Acer pseudoplatanus* and *Quercus borealis maxima* were grown under controlled conditions of soil, light, temperature and relative humidity. Size differences between roots of the two species are discussed. Main roots of Oak ranged from 0·75 to 1·00 mm. in diameter and of Sycamore from 1·25 to 1·60. Lateral roots of Oak ranged from 0·15 to 0·30 and of Sycamore from 0·4 to 0·6 mm. A distinguishing feature of Oak is the apparent lack of a root cap. Sycamore produced an abundance of root hairs 0·08–0·30 mm. long, 2–10 mm. behind the tips of growing main roots and laterals; the root-hair zone never extended to the tip. In Oak, no root hairs were seen on main roots, and those on first-order laterals were few in number and very short, less than 0·02 mm. long. After second-order laterals completed their growth, root hairs were produced throughout their length, often from the extreme root tip. [Cf. *For. Abstr.* 13 (No. 3682).]

3185. Duchaufour, P. Régénération de l'épicéa et pédologie. [**Spruce regeneration and soil science.**] *Rev. for. franç.* 5 (4), 1953 (257–68). 7 refs. [F.]

Summarizes the results of observations of Spruce regeneration in the Jura and Vosges, particularly of the root systems of seedlings. All the data lead to the conclusion that soil moisture in the summer is the limiting ecological factor for the establishment of Spruce regeneration. For this reason, root competition from parent trees and from grass and herbaceous weeds, and drying of the soil by insolation in large openings in the forest, are detrimental to Spruce regeneration. It was observed in all cases where these unfavourable conditions obtained and regeneration was very scanty, that the few surviving seedlings had exclusively superficial root systems, whereas in light, deep soils and otherwise favourable conditions, the seedling Spruce (often abundant and vigorous) has much deeper roots. It is concluded that for successful natural regeneration of Spruce the ideal conditions are a natural shelter formed by some woody species with deep tap roots, e.g. young Beech, Hazel or, preferably pole-stage Fir. Not only do the roots of these species leave free the top 15–25 cm. of soil preferred by young Spruce, but their light shade also lessens loss by evaporation from the soil and discourages herbaceous vegetation. [Cf. *For. Abstr.* 14 (No. 3169).]

3186. Duchaufour, P. De l'influence de l'humidité du sol sur la régénération du mélèze et de l'épicéa. [**The influence of soil moisture on the regeneration of Larch and Spruce.**] *Schweiz. Z. Forstw.* 104 (4/5), 1953 (173–8). 5 refs. [F.g.]

Availability of soil moisture during dry seasons appears to be a limiting factor for survival of seedlings of both species. The superficial root system of mature Spruce competes for moisture with the seedlings, which no doubt accounts in part for the failure of this species to regenerate itself naturally in pure stands. The deeper roots of Larch leave the seedlings of this species free to develop.

181.6. Life Form, Habit. Post-Seedling Development and Form

See also Nos. 3062, 3152, 3337–8, 3387–8, 3617–9.

3187. Stone, E. L., Jr. **The origin of epicormic branches in Fir.** *J. For.* 51 (5), 1953 (366). 6 refs.

With reference to a recent article on epicormic branching in *Abies concolor*, the author points out that this is from dormant, not from adventitious buds. Observation of *A. balsamea* and *A. concolor* shows that the meristems in the axils of many needles commonly persist as minute dormant buds. The same is true of Larches, Spruces and some

Pines. It is suggested that only species having this peculiarity form epicormics.

3188. Burger, H. Aufastung, Entnadelung und Zuwachs bei jungen Fichten und Föhren. [**Pruning, needle-stripping and increment of young Spruce and Pine.**] *Mitt. forstl. VersAnst., Mariabrunn* No. 47, 1951 (8–16). [G.g.]

Cf. *For. Abstr.* 13 (No. 156).

3189. Sirén, G. Alikasvoskuusten biologiaa. [**The biology of suppressed Spruce.**] *Acta for. fenn.* 58 (2), 1951. pp. 90. 107 refs. [Fi.e.]

Presents the results of an examination of the root systems of 100 suppressed and 10 unsuppressed Spruce trees. The root system of all 110 trees examined was found to be of adventitious origin. The longer the period of stunting, the younger relatively was the root system. In addition to acropetal and general adventitious ramification, there was often adventitious branching due to pathological causes. Comparison of assimilation surface in stunted and in vigorous trees showed that the proportion of root was much greater in the former, and the structure of the roots was coarser. The root system of stunted trees was also much more superficial. Reduction or elimination of root competition leads to intensified branching in the root system of suppressed trees.

A large part of the paper is occupied with the methods employed to determine the age of the sample trees. Best results were obtained by combining data derived from ring counts and from stem analysis with particular reference to pith nodes.

Examination of foliage showed that the number of needles per whorl of branches reached a maximum in 7- to 10-year-old branches in stunted individuals and later decreased rapidly. In vigorous individuals the number of needles increased up to a branch age of 11–15, decreasing slowly in older branches.

The experimental data are presented in 10 graphs and 12 tables, all of which have English as well as Finnish legends. There is an 8-page English summary.

181.7. Duration, Longevity, Stature; Records of Exceptional Age or Size. Effects of Age on Behaviour

See also No. 3625.

3190. Laughlin, K. **A floristic study of big trees of the Midwest.** *Phytologia* 4 (3), 1953 (153–71). 2 refs. A.P.B.

Data were collected on the diameters and circumferences of the biggest trees of each species found throughout a wide area of the Midwest (U.S.A.) and lists are presented giving details of size, age and location, with some general comments.

181.8. Phenology

See also Nos. 3035, 3062, 3149–50, 3323–5.

3191. Pechmann, H. von. Beobachtungen über den Ablauf des jährlichen Holzzuwachses von Fichten auf Gebirgsstandorten. [**Annual-ring formation in Spruce on montane sites.**] *Forstwiss. Cbl.* 72 (3/4), 1953 (124–30). 10 refs. [G.] [Institut für Holzkunde und Forstnutzung der Bayerischen Forstlichen Forschungsanstalt.]

Observations were made during the growing season of 1949 on different sites in the Bavarian foothills in: (1) a 50-year-old stand regenerated by direct sowing from seed not obtained locally, and (2) a relict of the primeval forest. Marked variations between trees on the two sites were found in the period during which tissue was laid down, and in the proportion of late to early wood. The conditions of the investigation do not permit final conclusions, but it was noticeable that stand (1), growing on a moist and favourable site, laid down tissue over an unusually long period, growth being resumed in late summer, whereas in stand (2) tissue formation had ceased by the end of July. The possible influences of climatic and hereditary factors upon these phenomena are discussed.

3192. Reinders-Gouwentak, C. A., and Veen, J. H. van der. **Cambial activity in *Populus* in connection with flowering and growth hormone.** *Proc. ned. Akad. Wet.* 56*C* (2), 1953 (194–201). 11 refs. [E.e.] O.R.S.

A marked difference was found between the effects of flowering catkins of ♂ and ♀ Poplars on cambial activity in the twig on which they grew. The opening of the ♀ catkins (*P. marilandica*) influenced the inception of wood and phloem production in the main axis of the twig beyond the region where the stalk trace bundles joined up with the stele of the twig; new wood and new phloem were found down to respectively 2 and 1 cm. beyond the junction of the steles. The short-lived ♂ catkins (*P. serotina*) often did not induce renewed wood production, and if they did so, it was only slight and rarely beyond the region of the junction; phloem production was found a few millimetres beyond the region of junction. The difference in growth in ♂ and ♀ catkins is probably due not to a different state of dormancy but to a difference in their growth-regulator content. An effect similar to that of the ♀ catkins was obtained on both ♂ and ♀ twigs when all catkins were removed and the fresh scar of the uppermost catkin was covered with a lanolin paste containing 100μg. of the Na salt of acetic acid. New vascular tissue was formed over a longer distance but not down the entire shoot length.

181.9. Miscellaneous [including Ecological Rôle after Death of Plants or Parts of Plants (but for Litter see Section 114.3)]

See also Nos. 2974, 3625.

3193. Chesters, C. G. C. **On the succession of microfungi associated with the decay of logs and branches.** *Transactions, Lincolnshire Naturalists' Union, Lincoln* 12 (3), 1950 (129–35 + 19 photos). O.R.S.

3194. Wallace, H. R. **The ecology of the insect fauna of Pine [*Pinus sylvestris*] stumps.** *J. Anim. Ecol.* 22 (1), 1953 (154–71). 20 refs.

Temperature fluctuations in stumps at soil level resemble those in fallen logs; in the buried part they resemble those of the soil. Changes in external temperature are more rapidly reflected in the wood

as decay progresses. Temperatures fluctuate less in forest stumps than in those in clearings. Stumps in sand reach higher temperatures than those in soil of high humus content. As the wood decays, the bulk density decreases and the moisture content increases. Since the moisture content of stumps is generally above 50%, the air in the galleries of wood-boring beetles is probably almost always saturated. Fungi chiefly invade the stumps via the roots and the bole about soil level. In clearings *Criocephalus ferus* and the fungi *Tricholoma rutilans* and *Hypholoma fasciculare* are the principal agents of stump destruction; in the forest the fungi alone are concerned. A total of 133 insect species was collected from stumps in all phases of decay. Beetles dominate the fauna. The distribution of the insect fauna is influenced by the site of the stump, phase of day and the type of wood-rotting fungus (brown or white rot).

As decay progresses, the total number of species increases, the number of xylophagous species decreases and the fungus-feeders increase. *From author's summary.*

182. *Synecology, Plant Sociology: General, Principles and Methods*

3195. Braun-Blanquet, J. Pflanzensoziologie: Grundzüge der Vegetationskunde. **[Plant sociology: the fundamentals of the science of vegetation.]** Springer-Verlag, Vienna. 2nd ed. (rev.) 1951. pp. xi + 631. 33 pp. of refs. [G.]

The second edition of this well known work, issued 23 years after the first, is a complete revision, expanded to almost double the original size and with twice as many illustrations. There has been some rearrangement of the general plan, which is now as follows: Part 1—The bases of social life among plants. Part 2—Plant communities, their investigation and systematic arrangement: (I) The basic units of vegetation, their structure and description. (II) 'Synecology', comprising the rôle of site factors and the life functions of members of the plant community and of the community as a whole (periodicity of outward and of physiological functions; competition). (III) Succession ('Syndynamics'). (IV) History of plant communities ('Syngenetics', 'Synchronology'). (V) Distribution of communities ('Synchorology'). (VI) Systematic classification of communities.

Allowing for some rearrangement, all sections have been more or less uniformly expanded, roughly in proportion to their original size. The most noteworthy changes are perhaps the placing of the sections on competition with the new sections on life functions, the transfer of life forms to section (I), and the revision of terms and matter in sections (III) and (IV) of this edition, where succession ('syndynamics') now stands in its own right while 'syngenetics' is merged into 'history of communities'. But much new matter has been added, to bring all the sections up to date. An extensive bibliography to the whole work is now provided. The index is still restricted to names of species and communities dealt with, the table of contents being the only means of tracing subjects.

182.1. Palaeoecology. History of Vegetation

See also Nos. 3172, 3216.

3196. Dimbleby, G. W. **The historical status of moorland in north-east Yorkshire.** *New Phytol.* 51 (3), 1952 (349–54). 7 refs. O.R.S.

The analysis of the pollen in the mineral soils in N.E. Yorkshire has been used to establish that what is now moorland was once deciduous forest. An examination of the old floor on which a Bronze Age barrow was built has shown that the soil at that time was not podzolized and that pollen contained in it included only a small amount of ericoid pollen. The bulk was from deciduous trees and Hazel. The same groups are found to-day in the moorland soil, along with ericoid pollen presumably deposited since Bronze Age times. It has been shown that the proportion of tree pollen present accords with the existence of a forest cover which must have been before Bronze Age occupation. In present-day deciduous forest soils a good deal of pollen may be found provided that they are not base-saturated soils. *Author's summary.*

182.2. Succession, Alternation and Periodicity in Vegetation

See Nos. 3180, 3199, 3215–6, 3484, 3625.

182.3. Units of Vegetation (Associations etc.)

3197. Beadle, N. C. W., and Costin, A. B. **Ecological classification and nomenclature. With a note on pasture classification, by C. W. E. Moore.** *Proc. Linn. Soc. N.S.W.* 77 (1/2), 1952 (61–82). 39 refs. D.S.I.R.

A scheme for the objective classification of plant communities is outlined. Classification on a structural basis is discussed and structural forms and subforms suitable for the description of the known Australian plant communities are defined. Units for the floristic classification of climax communities are defined and their usages discussed. These units are the *Association*, the *Alliance*, and the *Society*. Sub-units are also proposed. Structural units for the classification of the floristic units are proposed. These units are the *Subformation* and *Formation*. Seral communities are dealt with in the same detail and suitable units are defined. A glossary of ecological terms is included. *Authors' summary.*

182.4. Layer Communities

See also Nos. 2993, 3072.

3198. Tamm, C. O. **Growth, yield and nutrition in carpets of a forest moss (*Hylocomium splendens*).** *Medd. SkogsforsknInst., Stockh.* 43 (1), 1953. pp. 140. Many refs. [E.e.sw.] Price *Kr.*8.

Discusses the effect of light, other climatic factors and nutrient supply on the growth of the moss. [Cf. *For. Abstr.* 13 (No. 1976).]

187. *Vegetation Types*

See also Nos. 2967–8, 2977, 2979, 2987–8, 2993–6, 3022, 3135, 3147, 3197, 3224–6, 3236, 3241, 3342, 3625–7.

3199. Noirfalise, A. Étude d'une biocénose: la frênaie à Carex (*Cariceto remotae-Fraxinetum* Koch,

1926). **[Study of a biocoenosis: the *Cariceto remotae-Fraxinetum* of Koch.]** *Mémoires de l'Institut Royal des Sciences Naturelles de Belgique, Bruxelles* No. 122, 1952. pp. 156 + 2 plates. 82 refs. [F.f.]

A detailed study of the phytosociology, synecology, phenology, evolution, and succession of this association, particularly in Belgium. [Cf. *For. Abstr.* 14 (No. 2055).]

3200. QUÉZEL, P. À propos des forêts de hêtres (*Buxeto-Fagetum*) dans les canolles du Causse Noir. **[The Beech forests (*Buxeto-Fagetum*) in the gullies ['canolles'] of the Causse Noir.]** *Mém. Soc. bot. France* 1952 (12–6). 6 refs. [F.] O.B.D.

An ecological study of the vegetation in these mountain gullies, which appears to have preserved its primitive characteristics.

3201. SAUVAGE, C. Étude des groupements végétaux du chêne-liège au Portugal, comparaison avec quelques groupements marocains. **[A study of *Quercus suber* associations in Portugal compared with similar associations in Morocco.]** *Ann. Rech. for. Maroc 1951*, 1952 (73–89). [F.]

3202. CHOWDHURY, A. M. **Sal forests of northern districts of East Bengal.** *Pakistan J. For.* 3 (2), 1953 (84–6).

A short account of these more or less unmanaged, pure *Shorea robusta* stands, which are relicts of a former extensive forest.

3203. WAHEED KHAN, M. A. **South Raipur Sal [*Shorea robusta*] forest and its ecological study, with special reference to its management.** *Indian For.* 79 (3), 1953 (184–91).

3204. CHAUDHRI, I. I. **The vegetation of the water-logged areas of district Sheikhupura of Punjab.** *Pakistan J. For.* 3 (2), 1953 (74–83 + 1 gph. + 8 photos). 9 refs.

3205. BEVERIDGE, A. E. **The Menchali forest reserve.** *Malay. Forester* 16 (2), 1953 (87–93). 5 refs.

Describes a type of forest found on old raised beaches near the E. coast of Pahang. *Hopea nutans* and *Shorea materialis* are the dominant species and tend to form pure stands. Trees are small and slow growing but well formed. The soil is almost pure sand below the top few inches, with iron pan close to the surface.

3206. SAÏ, M. S. B. Note sur la végétation des hautes vallées du Sénégal et du Niger. **[The vegetation of the upper valleys of the Senegal and the Niger.]** *Comptes Rendus, 1ère Conférence Internationale des Africanistes de l'Ouest, Paris* 1, 1950 (407–31). 9 refs. [F.f.] Published by the Librairie d'Amérique et d'Orient Adrien-Maisonneuve, 11, rue Saint-Sulpice, Paris 6e. Sponsored by the Institut Français d'Afrique Noire, Dakar.

A study of the environment and vegetation, which is very degraded, relicts of mesophytic and hygrophytic forest bearing witness to the former existence of a much more humid climate. The destruction of the vegetation is essentially due to man.

3207. DEVOIS, J.-C. Peuplements forestiers de la Basse Casamance. **[Forest types of the lower Casamance [French West Africa].]** *Bulletin de l'Institut Français d'Afrique Noire, Dakar* 10, 1948 [1951?] (182–211). [F.]

3208. SCHNELL, R. Note sur le peuplement végétal des montagnes de l'Afrique occidentale et particulièrement du Massif du Nimba. **[The vegetation of the West African mountains, with particular reference to the Nimba range.]** *Comptes Rendus, 1ère Conférence Internationale des Africanistes de l'Ouest, Paris* 1, 1950 (496–504). 20 refs. [F.] Published by the Librairie d'Amerique et d'Orient Adrien-Maisonneuve, 11, rue Saint-Sulpice, Paris, 6e. Sponsored by the Institut Français d'Afrique Noire, Dakar.

Cf. *For. Abstr.* 14 (No. 1068).

3209. LÉONARD, J. Les forêts du Congo belge. **[The forests of the Belgian Congo.]** *Naturalistes Belges, Bruxelles* 34 (3/4), 1953 (53–65 + folding map). [F.]

An account of the principal vegetation types, with profiles of three types of forest, and a vegetation map.

3210. DARTEVELLE, E. Les Mangroves du Congo et les autres Mangroves d'Afrique occidentale. **[The Mangroves of the Congo and the other Mangroves of West Africa.]** *Bulletin des Séances de l'Institut Royal Colonial Belge, Bruxelles* 21 (4), 1950 (946–72 + 6 photos). [F.] L.S.

Notes on the distribution of the Mangrove stands, their flora and fauna, those of the Congo compared with other Mangrove stands of equatorial West Africa, pests, exploitation; the study of Mangrove and the need for a research centre.

3211. DUVIGNEAUD, P. Les formations herbeuses (savanes et steppes) du Congo méridional. **[The grass formations (savanna and 'steppe') of the southern Congo.]** *Naturalistes Belges, Bruxelles* 34 (3/4), 1953 (66–75). [F.]

The author holds that these vast areas of grassland are the result of clearing and burning of the original forest.

3212. **The vegetational communities of Nyasaland in outline.** *Rep. Dep. Agric. Nyasald. 1951* Part 2, 1953 (33–6).

A preliminary classification, based on one full season's investigations, giving type localities for each community distinguished.

3213. RIVALS, P. Études sur la végétation naturelle de l'Ile de la Réunion. **[Studies on the natural vegetation of the Island of Reunion.]** *Trav. Lab. for. Toulouse* t. 5, vol. 1, art. 2, 1952. pp. 214 + 47 photos. 12 pp. of refs. [F.]

3214. GALOUX, A. Les forêts de l'Amérique septentrionale tempérée: (Études écologiques). **[The forests of the temperate zone of North America: ecological studies.]** *Trav. Sta. Rech. Groenendael (Sér. A)*, No. 7, 1951. pp. 95 + 46 photos. 51 refs. [F.]

3215. MOSS, E. H. **Forest communities in northwestern Alberta.** *Canad. J. Bot.* 31 (2), 1953 (212–52 + 5 photos). 17 refs. O.R.S.

Spruce (*Picea glauca* and *P. mariana*), Tamarack (*Larix laricina*), Balsam Fir (*Abies balsamea*), Pine

(*Pinus banksiana* and *P. contorta* var. *latifolia*) and Poplar (*Populus tremuloides* and *P. balsamifera*) communities are described in terms of floristic composition and ecological relationships. The White Spruce association is regarded as the climax type of the region.

3216. Niering, W. A. **Past and present vegetation of High Point State Park, New Jersey.** *Ecol. Monogr.* 23 (2), 1953 (127–48). 59 refs.

The post-glacial history of the area is discussed, and the present vegetation types are described in detail. The present vegetational pattern is a result of man's activities superimposed upon climatic, edaphic, and physiographic conditions. On most sites where they occur, the Chestnut Oak, Pitch Pine/Scrub Oak, swamp hardwoods, and northern hardwoods communities are relatively stable. The Pine/Oak, White Oak/Hickory, and mixed Oaks/hardwoods communities, however, show evidence of change. In the more xerophytic communities, Oak is replacing Pine; in the more mesophytic ones, the northern hardwoods are replacing the Oaks and their associates. *From author's summary.*

3217. Russell, N. H. **The Beech gaps of the Great Smoky Mountains.** *Ecology* 34 (2), 1953 (366–74). 13 refs.

Analysis of environmental factors indicates that the persistence of *Fagus grandifolia* at high altitudes in the Smoky Mountains is largely due to its ability to stand great wind damage in the 'gaps' (dips in the ridge of mountains).

3218. Kurz, H., and Wagner, K. **Analysis of a virgin stand of Cypress.** *Abstr.* in *Journal of the Tennessee Academy of Science, Nashville* 27 (3), 1952 (201). L.S.

Composition and constitution of an unfelled area of virgin *Taxodium ascendens.*

3219. Schultze-Rhonhof, A. Pflanzengeographische Beobachtungen aus den Regenwäldern von Ecuador und den angrenzenden Gebieten von Colombia. **[Observations on plant distribution in the rain forests of Ecuador and the neighbouring regions of Colombia.]** *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie, Stuttgart* 75 (2), 1950 (221–70). [G.] L.S.

A collection of notes made during botanical expeditions.

3220. Beard, J. S. **The savanna vegetation of Northern tropical America.** *Ecol. Monogr.* 23 (2), 1953 (149–215). 87 refs.

Savanna formations in the West Indies, Trinidad, Guiana, Venezuela, British Honduras, and the Amazon basin are described. All types of climate in lowland tropical America, given favourable site conditions, are adequate to support woody growth of some kind. A tropical grassland climate does not exist. Savannas occur upon ill-drained country of little relief, generally a senile landscape such as an old alluvial plain or reduced upland. Savanna soils usually exhibit the superposition of a permeable horizon upon an impermeable, or are extremely compact and impermeable throughout the profile, so that no true water-table exists. Temperate grasslands, for which the term 'steppe' should be used, also represent a habitat almost perpetually adverse to growth, but here the causes are climatic. *From author's summary.*

3221. Rawitscher, F. Beiträge zur Frage der natürlichen Verbreitung tropischer Savannen. **[The natural distribution of tropical savanna.]** *Repr.* from *Mitteilungen der Geographischen Gesellschaft in Hamburg* 50, 1952 (57–84). 62 refs. [G.g.]

Discusses the formation of savanna, with particular reference to the 'campos cerrados' of Brazil and the way in which savanna vegetation fails to utilize the available groundwater. [Cf. *For. Abstr.* 13 (No. 3719).]

2. SILVICULTURE

See also Nos. 3134 *et seq.*, 3615.

3222. Haddington, 6th Earl of [Edited by M. L. Anderson]. **Some directions about raising forest trees.** Nelson & Sons Ltd., London. 1953. pp. 95 + 6 woodcuts. Price 12*s.* 6*d.*

Professor Anderson has edited, with an introduction and notes, a hitherto unpublished manuscript which appears to be the original draft of the celebrated 'Treatise on the manner of raising forest trees' first published in 1761.

3223. Anderson, A. Elementos de silvicultura. **[Elements of silviculture.]** *Rev. Agric., Costa Rica* 24 (9–12), 1952 (260 . . 8; 299 . . 306; 332 . . .9; 364 . . 72); 25 (1–3), 1953 (4 . . 10; 37 . . 44; 68 . . . 72). [Span.] A.N.B.

A concise account on conventional lines; includes a list of Costa Rican species with their uses.

3224. Versteegh, F. **Problems of silviculture and management of Mangrove forests in Indonesia.** *Docum. FAO Asia-Pacif. For. Comm. 1952* No. 77, 1952. pp. 5. Limited distribution: FAO, Rome.

The Mangrove forests of Indonesia have so far been, for the most part, exploited without regulation. Principles for the construction of working plans are suggested.

3225. Westveld, M. **Ecology and silviculture of the Spruce/Fir forests of eastern North America.** *J. For.* 51 (6), 1953 (422–30).

Suggests silvicultural methods based on a study of the climax forests of this type.

3226. LeBarron, R. K., and Jemison, G. M. **Ecology and silviculture of the Engelmann Spruce/Alpine Fir [*Abies lasiocarpa*] type [of the Rocky Mountains.]** *J. For.* 51 (5), 1953 (349–55). 16 refs.

Describes the silvicultural characters of the two species and discusses the silvicultural systems best adapted to the different varieties of this type, which ranges from British Columbia to Mexico.

3227. **Management of young even-aged stands of Southern Pine. Technical papers presented at First**

Annual Symposium, School of Forestry, Louisiana State University, Baton Rouge, Louisiana. March 13–14, 1952. Louisiana Forestry Commission, Baton Rouge. [1953?]. pp. 120.

3228. CONWAY, M. J. **The silviculture of Red Beech in Nelson and Westland.** *N.Z. J. For.* 6 (4), 1952 [1953] (291–308 + 4 photos). 6 refs.

Details are given of the ecology and rate of growth of Red Beech [*Nothofagus fusca*]. The suggested methods of silviculture are described, involving the conversion of natural Beech/Podocarp forest to even-aged Beech forest, and the tending of pole stands by frequent crown thinnings. A rotation of 120 years is desirable and practicable with an expected yield of 8000 cu.ft./acre on the best sites. [Cf. *For. Abstr.* 13 (No. 3725).] *From author's summary.*

3229. GUINIER, P. Le noyer, producteur de bois. **[The Walnut as a timber tree.]** *Rev. for. franç.* 5 (3), 1953 (157–77 + 8 photos). 12 refs. [F.]

Discusses the cultivation of Walnuts (primarily *Juglans regia*) for timber, the choice of site and silvicultural methods, and the economic importance of this species in France.

22. SILVICULTURAL SYSTEMS. CONSTITUTION AND COMPOSITION OF STANDS; FORMS OF STAND

221. *High Forest Systems*

See also No. 3277.

3230. **[The management of stands as regards the utilization of internal space.]** *Lesn. Práce* 31 (8), 1952 (339–67). [Cz.]

Four papers discussing the merits of various silvicultural systems with special reference to Czechoslovakian conditions: (1) Analysis of the problems of spatial arrangement within stands (*B. Doležal*); (2) Allocation of stands for regeneration from the management standpoint (*K. Matějů* and *A. Hatiar*); (3) Spatial arrangement within stands as understood by the silviculturist (*B. Polanský*), and (4) Practical experience in the regeneration of forest stands with regard to their spatial arrangement (*H. Konias*).

3231. SAINZ MARGARETO, M. Tratamiento de aclareos sucesivos uniforme en el monte 'Pinar de Navafría'. **[The uniform system in the 'Pinar de Navafria' forest.]** *Montes, Madrid* 9 (49), 1953 (59–67). [Span.]

Describes the course and results of experiments in the application of the uniform system to a *Pinus sylvestris* stand in Spain. The author is of the opinion that in such stands the usual 100-year rotation should be extended to 125 years.

3232. **[Regeneration fellings.]** *Rep. Sth. For. Exp. Sta. 1952* [1953?] (23–6).

In S. Arkansas four methods (felling to 6·5 in. d.b.h. and to 11·5 in. d.b.h., seed-tree and selective felling every 5 years) gave equally good regeneration of Loblolly/Shortleaf Pine. In S. Alabama logging costs per 1000 bd. ft. were roughly the same for light and heavy fellings; the proportion of milliacres stocked and the root-collar diameter of 1947 seedlings in 1952 were considerably higher when the overstorey was removed in the first or second year after the seed year (1947). In E. Texas seed-fall was much the greatest on shelterwood fellings, but at the end of the very dry summer of 1952 the number of seedlings/acre was higher for seed-tree fellings (688) followed by shelterwood and selection fellings (438 and 188 respectively) while no seedlings remained on strip clear-felled areas or those left unfelled. Results are tabulated.

3233. HOUGH, A. F. **Preliminary recommendations for the management of Black Cherry [*Prunus serotina*] on the northern Allegheny plateau.** *J. For.* 51 (3), 1953 (184–8). 8 refs.

Clear-cutting of narrow strips or small openings was found to be an effective way of regenerating Black Cherry stands.

3234. HAUFE, H. 30 Jahre Blendersaumschlag in Württemberg: Beiträge zur Kenntnis des praktischen Erfolges des Blendersaumsystems. **[30 years of the *Blendersaumschlag* system in Württemberg: its results in practice.]** J. D. Sauerländer's Verlag, Frankfurt a.M. [1952]. pp. v + 60. 81 refs. [G.g.] Price *DM*.4.10.

Reviews the application of Wagner's *Blendersaumschlag*, with chapters on: difficulties in assessing its results (lack of proper sample plots; deer damage; effects of war years; progressive modification of the system as understood by Wagner); forestry in Württemberg before its introduction; theory of the system; application in practice, and results, so far as ascertainable in view of the difficulties mentioned. Wagner's chief service now appears to have been that of hastening the abandonment of pure stands with clear felling in favour of mixtures obtained mainly by natural regeneration. The *Blendersaumschlag* in its classical form was too rigid, and many divergences arose which allowed more elasticity in practice. Present systems of regeneration—still apt to be termed '*Blendersaumschlag*'—are varied, but most often come close to the Bavarian strip-and-group methods (*Saumfemelverfahren*) and seem well adapted for the conversion of pure stands formed in 1870–1920, first to mixtures with a high proportion of light-demanders and eventually to many-storeyed forests of mixed light-demanders and shade-bearers.

3235. SILVY-LELIGOIS, P. La futaie par bouquets. **[The irregular shelterwood system.]** *Rev. for. franç.* 5 (3), 1953 (213–29 + 3 photos). 13 refs. [F.]

A lecture expounding the history and nature of the Swiss 'Femelschlagbetrieb'.

3236. ROSAYRO, R. A. DE. **Ecological considerations in the management of wet evergreen forest in Ceylon.** *Docum. FAO Asia-Pacif. For. Comm. 1952* No. 44, 1952. pp. 15. 15 refs. Limited distribution: FAO, Rome.

The distribution, general character and past history of wet evergreen forests in Ceylon are described [cf. *For. Abstr.* 13 (No. 1054)]. Analysis of enumeration surveys in both exploited and virgin stands indicates that the best form of management for the climax *Mesua/Shorea* type is a selection system of a more advanced type than is generally practised in the tropics. The *Dipterocarpus* community (now regarded as an edaphically conditioned

sub-climax) allows of more intensive fellings in order to obtain its establishment and perpetuation. The secondary high forest may also be worked by regeneration fellings based on Malayan 'seeding-felling' practice. *From author's summary.*

3237. Tregubov, V. Prebiralno gospodarstvo v manjših gozdnih enotah. **[Selection management in small forest units.]** *Izv. gozd. Inst. Sloven.* No. 1, 1947/49 (1950), (183–229). 19 refs. [Sloven.russ.f.]

Presents the results of studies on several model selection forests, said to be the best managed not only in Jugoslavia but in the whole of S.E. Europe. These are characterized by having trees of all diameter classes, no unregenerated gaps, and ample statistical material available. (1) The forest of Lehen in Pohorje, the former property of E. Pogačnik [cf. *For. Abstr.* 13 (No. 2999)], at present occupies an area of 400 ha., at 500–600 m. alt. The parent material is of the silicate type (sandstone conglomerate etc.); the soil acid, not podzolized, 20–50 cm. deep or more, but some rendzinas found on steep S. slopes. Traces of the original *Fagetum* are obvious; the Beech, used as firewood for the local glass industry, was succeeded by Silver Fir with some Spruce. The present association is *Abieto-Blechnetum*. The greatest danger to Fir regeneration is *Rubus fruticosus* which flourishes on felled areas and glades. Pogačnik, who had no forest training, bought a derelict forest (110 ha.) in 1909, and applied to its management a 'méthode du contrôle' identical with that propounded later by Biolley. He made improvement fellings (diseased and defective trees and those suppressing promising young growth). Fellings were made every 5 years, and enumerations ca. every 10 years. From 1909 to 1938, the volume of the original stand (110 ha.) increased from 164 to 219 cu.m./ha., with a considerable rise in the annual increment. Stand constitution and the c.a.i. in volume are analysed (tables and graphs) for several compartments on the basis of the successive enumerations, to show that in all cases a close approach to the ideal selection-forest structure has been achieved. (2) A stand of 18·8 ha. also belonging previously to Pogačnik is at Menišija near Cerknica. A typical karst area, bare rock outcrops occupying 40% of its surface, it lies at 600 m. alt. The surrounding community is *Fagetum*, but the stand consists of Fir and some Beech. Fir is not at its optimum and regenerates with difficulty since various shrubs (mostly *Corylus avellana*) appear on glades and felled areas. The 1909–38 m.a.i. averaged 9·07 cu.m./ha., equivalent to 3·3%. Treatment was the same as for (1). (3) A 30-ha. forest near Cerknica, ca. 80% Fir + 20% Beech. Site conditions as (2). The stand has a regular selection structure, and a very high volume (441 cu.m./ha.). (4) Forest of Beč (near Cerknica), ca. 100 ha., at 800 m. alt. in a typical karst area (rock outcrops cover 30% of its surface). The community is *Fagus abietetosum*, with optimum conditions for Fir. The selection structure is not quite regular. Volume 401 cu.m./ha. (5) Four sample plots were investigated in the Stojne forest near Kočevje at 800–900 m. alt., with conditions similar to those of (4). Species: Fir, Beech, Spruce with varying regularity of selection stand structure. The volume in one plot was 420 cu.m./ha.

An ideal Fir-stand equilibrium structure has been worked out from the above investigations, claimed to be valid for Slovenian conditions. It is based on the assumption that the maximum exploitable diameter class, for economic management, is 50–60 cm. It is recommended that small selection-type forests be grouped into larger management units, within which more or less similar sub-units bearing the same forest type, would be delimited. Selection treatment would be applied to the whole area, but in order to save much troublesome work, the strict 'méthode du contrôle' would be confined to typical sample areas (5–15 ha. each) selected within each sub-unit.

222. *Coppice, Pollarding and Lopping Systems*

See Nos. 3238, 3250, 3374, 3389.

226. *Changes of Silvicultural System. Conversion (by System or Species)*

See also Nos. 3228, 3234.

3238. Parant, E. Les résineux au service de la conversion feuillue. **[The conifer as an aid in the conversion of broadleaved coppice.]** *Rev. for. franç.* 5 (3), 1953 (341–6 + 5 photos). [F.]

Recommends the planting of a temporary stand of conifers under the seed trees left to regenerate areas of coppice-with-standards in process of conversion to high forest. An example of this is described, where Silver Fir was planted under Beech shortly before conversion began. When Beech regeneration is established, the Fir can be removed or alternatively left to form a permanent mixture. Among the advantages of this method is the greatly improved form of the Beech seed trees.

3239. Fröhlich, J. Über Versuche mit der Bucheneinbringung in reine Fichtenbestände. **[Experiments on the introduction of Beech into pure Spruce stands.]** *Mitt. forstl. VersAnst., Mariabrunn* No. 47, 1951 (17–22). [G.g.]

(1) Some 15–18 years ago, local 3- to 4-year Beech wildings were planted in gaps caused by snow damage in Spruce polewoods on the eastern slopes of the Gmunderberg, Traunsee, at 500–800 m. alt. These plantings succeeded: the Beech is now well developed and 3–5 m. tall. (2) Ca. 18 years ago some agricultural land was planted with 4-year Spruce transplants and 2- to 4-year Beech seedlings mixed individually or by rows, and left untended for 15 years, when much healthy suppressed Beech was found hidden under the Spruce. The Beech was then liberated and now shows a good response, though tending will still be necessary to reduce Spruce competition. (3) Direct patch sowings of Beech were made in autumn of the 1946 mast year on the opened margins of pure Spruce stands, and in gaps due to snow and wind breakage in 40- to 60-year-old Spruce. These succeeded only where the spring sunlight had full access to the soil: sowings shaded by the old canopy practically all failed.

228. *Constitution and Composition of Stands; Forms of Stands. Tree Classes*

See also Nos. 3189, 3218, 3228, 3357–8, 3603, 3618, 3625–7.

3240. Gothe, H. Lärchen-Mischbestockungen auf Buntsandstein, unter besonderer Berücksichtigung der Vergesellschaftung mit der Buche. [**Mixed stands of Larch on Bunter sandstone, with special reference to its association with Beech.**] *Forst u. Holz* 8 (8), 1953 (109–14). [G.]

Mixed Larch and Beech form one of the most important types in the west German Larch-growing region. A point to be carefully considered when establishing such stands is the fact that mountain varieties of Larch show a progressive decline in height and diameter increment in the second decade of growth. The particular nature of the site, especially in even-aged mixed stands, must also be studied carefully. Methods of establishing and tending such stands are reviewed and the inclusion of other species, especially Pine, is considered. Some examples of German Beech/Larch stands are cited, illustrated and discussed.

3241. Michelson, A. Considérations sur la forêt spontanée africaine et son exploitation. Statistiques relatives à la régénération naturelle de cette forêt. [**The natural African forest and its exploitation. Statistics relative to its natural regeneration.**] *Études for. Com. nat. Kivu* No. 5, 1953. pp. 90 + 9 dgms. [F.]

Presents and discusses the data derived from counts of reproduction on a number of plots in (1) virgin forest, (2) old forest fallow in (*a*) montane, (*b*) transitional, and (*c*) tropical rain forest in the Belgian Congo, illustrated by diagrams in plan and elevation detailing the species composition of the different storeys. Reproduction of the upper-canopy species averaged 2·4/sq. m. of forest floor in (1) and 3·2/sq. m. in (2), with a proportion of accidentally damaged stems of 7–15% in (1) and 50–75% in (2). The distribution of reproduction on the forest floor was very irregular in both types, but more so in (2) than in (1).

23. REGENERATION AND FORMATION OF STANDS

231. *Natural Regeneration*

See also Nos. 3134–5, 3140–1, 3170, 3182–3, 3185–6, 3231–7, 3241, 3269, 3347, 3357–8, 3625.

3242. [**Regeneration and mortality of *Callitris glauca* and *Eucalyptus crebra*.**] *Rep. Dir. For. Qd. 1951/52*, 1952 (9).

Thirty plots laid out in 1940 were examined in 1950 and the following points emerged: (1) Mortality of Cypress [*Callitris glauca*] regeneration is low and does not exceed 10% of stems less than 10 ft. high. (2) Cypress regeneration is generally adequate on sandy Cypress sites and on Poplar Box [*Eucalyptus* sp.] sites. Since 1940, stocking has increased by over 100/acre. (3) Cypress regeneration is poorer on sites where there is much *E. crebra* and dense sapling growth of Bull Oak (*Casuarina luehmannii*). (4) Protection from fire, silvicultural treatment, and removal of Prickly Pear have promoted regeneration of Cypress but not that of Ironbark [*E. crebra*]. Progress of both species into the 10 ft. + class has been assisted. (5) Mortality of *E. crebra* is high, more than 50% of stems below 10 ft. high failing to reach 10 ft. (6) Regeneration of *E. crebra* is inadequate where Cypress predominates and Bull Oak saplings are dense.

3243. Conover, D. F. **Effects of competition on Red Pine and White Pine reproduction.** *Tech. Note Lake St. For. Exp. Sta.* No. 392, 1953. pp. 2.

Observations on two 140-year Red Pine/White Pine stands showed that regeneration of the former was hampered by competition from brush and the presence of a heavy overstorey, conditions in which seedlings of White Pine grew and increased in number. To favour Red Pine regeneration mixed Red Pine/White Pine stands over 120 years old should be reduced to a b.a. below 90 sq. ft./acre.

3244. Cooper, R. W. **Prescribed burning to regenerate Sand Pine.** *Res. Note Stheast. For. Exp. Sta.* No. 22, 1953. pp. 1.

Prescribed burning was used on several test plots of 10–20 acres on the Ocala National Forest in late Aug. 1951. On a plot back-burned just before felling, little damage was done to mature timber, germination of seed released by cones from the slash followed during the winter, and yearling counts showed approximately 1618 seedlings/acre and a milliacre stocking of 64%. A back-burn in a stand just after felling, consumed cones and seed in the slash and damaged residual trees; reproduction was scarce. In head-fires in stands freshly felled, or 1 or 2 years after felling, most of the residual trees, 30–40/acre, regarded as seed trees, were killed, the cones opened and seeds were released; yearling counts show adequate stocking in plots burned by head-fires when freshly felled or one year after felling. Further experiments are needed. [Cf. *For. Abstr.* 14 (No. 239).]

3245. Steele, R. W. **Thirty years of natural regeneration on a Douglas Fir cutover area.** *J. For.* 51 (6), 1953 (430–1). 1 ref.

Further plot data on a long-term research project [cf. *For. Abstr.* 8 (No. 203)]. The study shows that rate of re-stocking varies greatly with aspect.

3246. Marion, J. Note sur la régénération naturelle du chêne-liège en forêt de Mamora. [**Note on the natural regeneration of Cork Oak in the forest of Mamora [Morocco].**] *Ann. Rech. for. Maroc 1951*, 1952 (25–57 + 4 photos). 10 refs. [F.]

These natural stands of *Quercus suber* are no longer regenerating themselves from seed, owing to overgrazing, erosion, removal of litter and acorns, and destruction of undergrowth. Desirable lines of research are suggested.

3247. Fourchy, P. Travail du sol et régénération. [**Soil cultivation and regeneration.**] *Rev. for. franç.* 5 (5), 1953 (328–40 + 3 photos). 8 refs. [F.]

Mainly a review of literature on the beneficial effects of soil scarification in encouraging natural regeneration of Beech, Oak, Larch, Scots Pine, and Spruce.

3248. KERMODE, C. W. D. **The use of 'taungya' in natural regeneration operations.** *Burmese For.* 2 (2), 1952 (65–70).

A short account of the circumstances in which, before World War II, the taungya system of regeneration was extended to hitherto untried types of forest, chiefly those dedicated to supplying village needs, with varying reliance on existing natural regeneration and departmental tending. Examples are described from dry Teak forest and eastern laterite evergreen.

3249. U SAW TUN AUNG. **Regeneration of Teak in Burma.** *Burmese For.* 2 (2), 1952 (71–8).

Random notes on problems of Teak silviculture. It is presumed that most of the old Teak stands in *yoma* forests originated after gregarious flowering of Bamboo. Natural regeneration in such stands is inadequate and should be supplemented by stump planting in openings resulting from extraction. Wide spacing in partial sunlight will prevent epicormic branching.

3250. KHANNA, L. S. **Khair [*Acacia catechu*] coppice.** *Indian For.* 79 (3), 1953 (201–4).

Mature sub-montane *A. catechu* felled flush with the ground in March and fenced against cattle, gave good coppice regrowth (77%). The tallest shoots came from the 20- to 24-in. and over 24-in. diameters. Fencing is essential to success.

232. *Artificial Regeneration*

See also Nos. 3141, 3249.

3251. PARRY, M. S. **Tree-planting in Tanganyika. 1. Methods of planting.** *E. Afr. agric. J.* 18 (3), 1953 (102–15). 13 refs.

Notes on direct sowing, nursery practice, and plantation technique (including blank filling, thinning and pruning), with an additional note on pots for transplanting.

232.1. Choice and Trial of Species, Races, etc.

See also Nos. 2976, 3084, 3148, 3150, 3153, 3160, 3340.

3252. BABOS, I. Erdömüvelési feladataink. **[Our tasks in silviculture.]** *Agrártudomány, Budapest* 4 (6), 1952 (217–23). [Hu.]

After introducing the general problem in its national context the author specifies two tasks: planting of conifers in place of other species, and the afforestation of duneland. At present only 5·4% of the total forest area in Hungary is under conifers. In April 1951 the former Forestry Centre laid down a 20-year plan to increase the proportion of conifers in each district to 20 or 30% with definite targets for each species, Scots Pine being chiefly favoured. These and the % area adjustments as between the chief hardwood species and conifers, are tabulated; at present only 1,853,624 cadastral *holds* are actually stocked, another 52,800 *holds* of forest land being classed as cleared, barren etc.

Among areas to be cleared for coniferous planting the author specifies the counties of Zala, Vas, Nógrád, Heves and Borsod where faulty tending has led to a predominance of *Quercus cerris* and Robinia. Identical soils can be seen carrying stands of Robinia and stands of Scots Pine, Spruce and even Larch. Other conifer sites are the southern slopes of the Mátra and Bükk mountains and the Nógrád forests where the indigenous *Q. cerris* and the intrusive Robinia can in many places be profitably supplanted by *P. sylvestris* and *P. nigra*. More care is necessary over the substitution of species on the loess slopes of Transdanubia; on the tops of hillocks where the soil is light and dries out to a great depth, there may be no substitute for *Q. cerris* and this is a species that should not be entirely eliminated from Hungarian forests.

The 'Robinia graveyards' often seen on sandy soils are the result of extensive experimentation in the past. Robinia is certainly an exacting species and from practical experience the author can define precisely its useful upper limit on sand. At the same time, the growth of odd specimens of Robinia among conifers is vigorous enough to show that conifer planting will not mean its extermination.

Undoubtedly a great part of Transdanubia is suitable for planting *P. sylvestris*. Optimum soil conditions occur on the western borders, where the well known indigenous stands are located. (Fenyöfö, Zselicseg.) The importance of *P. nigra* is growing: specimens at Alcsut, Ottömös, Debrecen-Nagyerdö and Téglás-Angolkert surpass even the best of *P. sylvestris*. Industry no longer distinguishes between the two species and *P. nigra* is preferable in the drier areas of Transdanubia and Nyírség.

The other coniferous species are of limited importance. Spruce justifies itself at 100 years only on the western slopes of Örség (Sopron district); elsewhere it deteriorates at 40–50 years. Even so it is worth planting if this is done carefully, especially in groups among young Beech. Larch demands the continental limits of climate; a difference according to S. Jablonczy of 18·3° C. between mean summer and winter temperatures. Silver Fir: its occurrence on lowland soil, and its ready natural regeneration, are surprising, and call for caution in propagating it.

The merits of quick-growing broadleaved species are next discussed, including Ash and Walnut. Grey and White Poplars are the most suitable for duneland afforestation; Black Poplar and Aspen only locally.

Species recommended for interplanting include Maples, Lime, Celtis, and *Fraxinus americana*. The Hungarian duneland afforestation scheme, involving an area of 100,000 holds, prescribes close spacing with early and frequent thinnings, so that, e.g. Poplar will start at 2 × 4 m. and stand 8 × 8 m. after 20 years.

3253. LACAZE, J. Essences résineuses californiennes susceptibles de s'acclimater au Maroc. **[Californian coniferous species suitable for trial in Morocco.]** *Ann. Rech. for. Maroc 1951*, 1952 (91–136 + 4 photos). [F.]

Gives meteorological data, soil requirements, and silvicultural characters for the following species as observed in various localities in California, with an indication of possibilities of acclimatization in

Morocco: *Libocedrus decurrens*, *Pinus albicaulis*, *P. attenuata*, *P. coulteri*, *P. jeffreyi*, *P. monophylla*, *P. muricata*, *P. ponderosa*, *P. radiata*, *P. sabiniana*, *P. torreyana*, *Pseudotsuga macrocarpa*, and *Sequoia gigantea*.

3254. Dimitri, M. J. Consideraciones sobre árboles y arbustos cultivados en el litoral patagónico. [**Trees and shrubs cultivated in the coastal areas of Patagonia.**] *Idia* 5 (58), 1952 (1–10). [Span.] C.G.B.

Describes the climate and topography of Patagonia as a whole and conditions prevailing in different regions of the country, enumerates trees and shrubs found thriving in each region, and recommends species for cultivation, mainly as windbreaks.

232.11. *Species Trials (by localities), including Forest Gardens, Trials of Exotics etc.*

See also Nos. 2976, 3084, 3139, 3279, 3615.

3255. Pourtet, J. Le mélèze du Japon. [**Japanese Larch (*Larix leptolepis*).**] *Rev. for. franç.* 5 (4), 1953 (291–6). [F.]

Notes on silviculture and results of planting in Western Europe.

3256. Schrötter. Über Vorkommen und Anbau, Herkunft und Rassen der japanischen Lärchenbestände in Schleswig-Holstein. [**Occurrence, establishment, origin and strains of Japanese Larch in Schleswig-Holstein.**] *Forst u. Holz* 8 (5; 6), 1953 (57–60; 76–9). [G.]

Describes the history of the establishment of the stands, the methods used, yield and growth form of the Larch, and discusses the different strains found in the Schleswig-Holstein forests, their origin and characteristics.

3257. Pendlebury, C. L. **Eucalypts in Great Britain.** *Quart. J. For.* 47 (2), 1953 (137).

A note on experimental plantings of *E. globulus*, *E. gigantea* and *E. viminalis* in Cornwall.

3258. Bagnaresi, U. I castagni giapponesi d Aiello Calabro. [**The Japanese Chestnuts of Aiello Calabro.**] *Monti e Boschi* 4 (4), 1953 (160–5). 5 refs. [It.f.e.]

The morphological characters of an experimental plantation near Cosenza are described and compared with those of *C. crenata* grown at Florence and Lucca. It is concluded that the southern Apennines are particularly suited to this species.

3259. Marković, L. Proučavanje razvoja veštački podignutih sastojina nekih vrsta četinara na Avali. [**The development of plantations of some conifer species at Avala.**] *Rad. Inst. nauč. Istraž. šum., Beograd* No. 1, 1950 (62–109). 11 refs. [Serb.f.]

Between 1895 and 1914 the Serbian Forest Service replanted with conifers nearly all the land from which Oak had been cleared in the Avala State Forest. Sample plots were established in 1946 to study the development of these stands, and some data are presented, on the basis of which the following recommendations are made: *Pinus nigra* var. *austriaca* may be used for reforesting cleared land, and for interplanting in poor coppice stands of hardwoods. *P. sylvestris* may be introduced into poor coppice, where it should be planted in groups. *Pseudotsuga taxifolia* may also be planted in groups to improve coppice and other kinds of forest. *Picea abies* is not recommended for this district.

3260. Nair, K. N. R. **The cultivation of Balsa (*Ochroma lagopus* S.W.) [in South India].** *Indian For.* 79 (3), 1953 (163–8 + 4 photos). 2 refs.

A review of experiments and methods.

3261. Thirawat, S. **Experience with exotic trees in Thailand.** *Docum. FAO Asia-Pacif. For. Comm. 1952* No. 68, 1952. pp. 28 + tbls. Limited distribution: FAO, Rome.

Gives some data on experiments with *Eucalyptus* spp., *Casuarina junghuhniana*, and *Aleurites montana*.

3262. Barnard, R. C. **Experience with exotic tree species in Malaya.** *Docum. FAO Asia-Pacif. For. Comm. 1952* No. 27, 1952. pp. 17. Limited distribution: FAO, Rome.

Statistics and data are given on land and forest area, climate, growth rates of exotic tree species, and soils. General problems of afforestation and artificial regeneration in Malaya and current research programmes are discussed.

Nursery and planting experience with the following species are described; *Eucalyptus deglupta*, *E. robusta*, *E. alba*, and other *Eucalyptus* species, *Swietenia macrophylla*, *Gmelina arborea*, *Shorea gysbertsiana*, *Hymenaea courbaril*, *Eusideroxylon zwageri*, *Pinus insularis*, *Tectona grandis*, and *Albizzia falcata*.

The timber quality, stem form and rate of growth of many indigenous tree species leaves little to be desired. Certain exotics are likely to prove useful for afforestation of sites where the microclimate is unsuited to Malayan high-forest forms but would need to be outstanding in timber quality, rate of growth or ease of establishment to be introduced in productive forest in place of indigenous species of which natural regeneration can be successfully and economically established. *From author's summary.*

3263. **Experience with exotic tree species in Indonesia.** *Docum. FAO Asia-Pacif. For. Comm. 1952* No. 74, 1952. pp. 27. Limited distribution: FAO, Rome.

Tabulated data are given on a number of species, with more detailed notes on *Acacia* and *Eucalyptus* spp.

3264. Caguioa, V. **Planting exotic species in the Philippines.** *Docum. FAO Asia-Pacif. For. Comm. 1952* No. 49, 1952. pp. 17. Limited distribution: FAO, Rome.

The results of trials of some 65 exotic spp. are tabulated.

3265. **Means of increasing productivity of exotic forests: symposium at 1952 annual meeting of the New Zealand Institute of Foresters.** *N.Z. J. For.* 6 (4), 1952 [1953] (339–50).

Summarizes the following papers:—Means of improving the genetical quality of forest seed in New Zealand (*I. J. Thulin*); the possibilities of increasing productivity in exotic forests by species selection (*H. V. Hinds*); the full use of forest land by the planting of minor species (*J. E. Henry*); some observations on initial stand density and its influence

on growth increment and timber quality of *Pinus radiata* (*R. S. Macarthur*); contract pruning at Karioi Forest (*J. L. Ormerod*); the Larch [*Larix decidua*] management problem in Waiotapa Forest (*H. B. Fleming*).

3266. Henry, J. E. **Eucalypts suitable for New Zealand forestry.** *N.Z. J. For.* 6 (4), 1952 [1953] (309–17 + 2 photos).

Eucalyptus spp. selected as the most suitable for forestry purposes in New Zealand are classified according to their climatic requirements. Their growth characteristics and utilization properties are discussed and a technique of nursery treatment for planting with open-rooted stock is described in detail. *From author's summary.*

3267. Pierlot, R. Techniques sylvicoles applicables à quelques essences forestières introduites au Kivu et au Ruanda. [**Silvicultural techniques for some forest species introduced into Kivu and Ruanda.**] *Bull. Inform. Inst. nat. Étude agron. Congo belge* 11 (2), 1953 (77–92). [F.]

Makes recommendations, based on results in trial plantations, on the treatment of *Prunus salasii* (as an understorey species), *Eucalyptus* spp., *Cupressus* spp., *Grevillea* [*robusta*?] and *Pinus* spp., in the Belgian Congo.

3268. [**Trials of exotic Pines in Nyasaland.**] *Rep. For. Dep. Nyasald. 1951*, 1952 (10).

Pinus patula grows well between altitudes of 3000 and 6000 ft., provided that the rainfall is 45–50 in. and over. It seems to be tolerant of a wide range of soils, but is least successful on the heavy clay soils found on the lower slopes of certain mountains. Inoculation of the soil with mycorrhizae is essential for the establishment of Pines. During the past 20 years more than 20 species have been introduced, of which a number show considerable promise, the most important being *P. patula*, *P. caribaea*, *P. taeda* and *P. pseudostrobus*. The earliest introductions of these have now reached sawlog size, and *P. longifolia*, *P. radiata*, *P. merkusii*, *P. khasya* and *P. leiophylla* have also yielded sawtimber.

3269. [**Natural regeneration of exotic conifers in Nyasaland.**] *Rep. For. Dep. Nyasald. 1951*, 1952 (10).

The appearance of scattered natural seedlings of exotic Pines in thinned areas has been noted in several plantations during the past few years. The species most evidently regenerating is *Pinus taeda*, but seedlings of *P. patula* and *P. leiophylla* were found within 6 months of second thinnings in 15-year-old plots of these species. *Cupressus lusitanica*, *Callitris calcarata* and *Callitris robusta* regenerate profusely.

232.12. *Races and Provenance Trials*

See also No. 3061.

3270. Edwards, M. V. **Frost damage to Sitka Spruce plants in the nursery and its relation to seed origin.** *Scot. For.* 7 (2), 1953 (51).

Queen Charlotte Islands Sitka Spruce is more resistant to frost when growing in Scotland than plants of U.S. origin. Experience with seedlings from seed collected in older Sitka Spruce woods in Scotland suggests that many of these woods are of U.S. provenance.

3271. Soest, J. van. Herkomstonderzoek van de groveden (*Pinus sylvestris* L.) in Nederland. [**Provenance research on *P. sylvestris* in the Netherlands.**] *Uitvoer. Versl. Bosbouwproefsta. T.N.O., Wageningen* 1 (1), 1952 (1–48 + 2 tbls.). 13 refs. [Du.du.e.]

Results of measurements in 1948 [cf. *For. Abstr.* 12 (No. 964)] on 3 series of sample plots in different parts of the Netherlands on randomly selected trees of 21, 22 and 39 years, are given in graphs and tables with Dutch and English legends. Data include height, volume, basal area, diameter, amount of branching and crown size. Observations on stem form were made in 1951. The significance of differences between different provenances was determined statistically. After allowances had been made for differences in site quality and in the degree of attack by *Lophodermium pinastri*, the mean heights were found to be greatest for provenances in the Netherlands or neighbouring countries, decreasing with increasing distance from the land of origin. No correlation was found between stem form and geographical origin of the seed. There is a full English summary and a list with definitions in Dutch and English of the mensurational notation, which is that used by the mensuration department of the Bosbouwproefstation T.N.O.

3272. **Standardized working plan for local tests of seed source [designed primarily for Southern Pine] prepared by the Committee on Southern Forest Tree Improvement, Subcommittee on Geographic Source of Seed.** Southern Forest Experiment Station, New Orleans, La. 1951. pp. 11. 16 refs.

3273. **Working plan for co-operative study of geographic sources of Southern Pine seed.** Southern Forest Experiment Station, New Orleans, La. 1952. pp. 35.

The plan, evolved by the Committee on Southern Forest Tree Improvement, Subcommittee on Geographic Source of Seed, covers experimental design, seed, nursery-stock production, planting, plantation inspections, analyses of results, and salvage in the event of mishap. Co-operating bodies may (1) contribute seed from known and described sources; (2) produce and ship correctly labelled nursery stocks, and plant out stock to exact specifications, making periodic specified measurements. The rights and responsibilities of co-operators are discussed. The species covered are *P. palustris*, *P. caribaea*, *P. taeda* and *P. echinata*, and the hypotheses to be tested are that geographic races are associated primarily with (1) temperature, (2) rainfall and soil, or (3) origin upon or migration from land masses separated by the seas formerly covering the southern coastal plain; or that geographic races of Southern Pine do not exist.

3274. Shigemoto, M. [**The growth of various races of Sugi (*Cryptomeria japonica*) at Kitayama, Kyoto. (1) Comparison of the growth of 'Shibahara' with 'Tanesugi'.**] *J. Jap. For. Soc.* 34 (3), 1952 (89–91). 3 refs. [Jap.e.]

Measurements of 5-year trees of the two races planted in mixture are given in tables with English legends and show greater height and diameter for Tanesugi than for Shibahara.

232.13. *Trials of Hybrids and Other Products of Tree Breeding*

3275. Nakamura, K., Satoo, T., and Goo, M. **[The influence of parent trees of *Cryptomeria* on their progeny. (3) Growth of the progeny in plantations.]** *Bull. Tokyo Univ. For.* No. 43, 1952 (39–47). 7 refs. [Jap.e.]

Progenies obtained by free pollination from 10 trees of *C. japonica* in 3 stands were planted in randomized arrangements, and height, d.b.h., diameter and height increments, amount of branches and needles, and stem-wood growth per unit weight of branches and needles, were compared at 20 years. Progenies of trees in old stands showing excellent growth proved superior in both height and diameter to those of trees in a young stand of poor growth. Both branch and needle weight, and the stem-volume increment per unit weight of branches showed a similar trend. The progress of height and diameter increment obtained from stem analyses of sample trees showed that differences between progeny became significant only at 13 years. As the height order of 10 sample trees varied considerably at the 3rd, 6th and 20th year, too early a selection in progeny trials is not desirable. [Tables and graphs have English text.] *From authors' summary.*

3276. Sukačev, V. N. O nekotoryh novyh suhoustoičivyh ivah. **[Some new drought-resistant Willows.]** *Dokl. Akad. Nauk SSSR* 84 (2), 1952 (349–52). 5 refs. [Russ.] A.P.B.

A brief account of trials of selected species and hybrids begun in 1939–40 in the Borisovka district in the S. of Kursk Province. The plantation area was former agricultural land surrounded by Oak forest, on a plateau with deep, dark-grey forest clay-loam soil and a water-table 15 m. or more below ground-level. Since 1945, parallel comparative trials of the same varieties have been in progress in the Serebryannyĭ Bor near Moscow. The drought of 1946 was so severe in the Kursk area that Oak lost its leaves towards the end of August; the Willows, however, remained green and even *Salix viminalis* and its allies suffered little. A table is presented of the most drought-resistant varieties, suitable for shelterbelt plantations in the forest steppe and the north of the steppe zone, giving for each the maximum and modal lengths of the 1-year osier rods in Kursk (1946, drought year; 1945, ± normal year) and Moscow (1949), viz.: *S. purpurea* × *S. caspica*, *S.p.* var. *busulukensis* × *S.p.* var. *lambertiana*, *S.p.* var. *lambertiana* × *S.p.*, *S.p.* var. *lambertiana* × *S. rossica* var. *obensis*, *S.p.* × *S. chilkoana*, *S. ilkensis* × *S.p.*, *S. dahurica* × *S.r.*, *S.r.* × *S.c.*, *S.r.* × *S.r.* var. *obensis*, *S. stenophylla* × *S. tenuifolia*, *S.r.* × *S. arenosa*, *S.p.* var. *busulukensis*, and *S.p.* No. 2. Notes are included on the number of osiers per stool for some of these at spacings of 30 × 70 and 100 × 100 cm., and on the type of osier produced.

The mortality of newly planted cuttings is high in drought years, but cuttings surviving their first year or two are established and will stand severe drought in subsequent years. Some of the varieties may prove suitable for cultivation still farther south in the steppe.

232.2. Preparatory Work, Auxiliary Measures

See also Nos. 3247–8, 3348.

3277. Goor, C. P. van. Bewerking en vruchtbaarheid van droge bosgronden. **[Cultivation and the fertility of dry forest soils.]** *Uitvoer. Versl. Bosbouwproefsta. T.N.O., Wageningen* 1 (2), 1952 (51–99 + 2 tbls.). 57 refs. [Du.du.e.]

The investigation was carried out on 50 sample plots, 25 of which had been cultivated 50–100 years earlier to an average depth of about 50 cm. It showed that on these sites (brown podzolic soils on the push-moraine complex of the central Netherlands) deep cultivation acted unfavourably by (1) increasing biological activity in the soil, thus bringing about the mineralization of the organic matter; (2) causing loss of available N and P from the soil; (3) reducing the stability of the soil structure; and (4) causing deterioration by acidification and leaching of the soil profile. It is suggested that on these soils regeneration after clear felling—a practice involving cultivation for weed control—should be abandoned in favour of a shelterwood system.

232.3. Seed, Nursery Practice, Direct Sowing

3278. Pein, E. Forstsamengewinnung und Forstpflanzen-Anzucht in den USA und in Deutschland. **[The production of forest seed and planting stock in the U.S.A. and Germany.]** Verlag M. & H. Schaper, Hannover. 1953. pp. 218. 13 refs. [G.e.]

This book, by the chairman of the Zentralverband der Forstsamen- und Forstpflanzenbetriebe e.V. [Central Union of Forest Seed and Nursery Enterprises], consists for the most part of a general comparison of U.S. and German practice—with frequent suggestions for the improvement of the former, and sometimes of the latter—based on a two months' study tour in the U.S.A. in 1951 and the author's experience (over 50 years) as a professional nurseryman in Germany. There are copious illustrations, chiefly photographs showing methods and equipment used in both countries. The main chapters, all of which carry English summaries explaining German conditions and practice, report on: General organization of U.S. forestry, with special reference to forest seed and nurseries. Seed certification and provenance, with notes on American tree species of potential value for Germany. Seed collection, extraction, storage and viability, with emphasis on the influence of extraction conditions upon viability, and the importance of high germinative energy. Nursery sites, soil preparation and manuring—especially the value of animal manures. Stratification, sowing season and methods, and protective measures during germination. Transplanting, with suggestions for improved design of U.S. planting machines. Tending—weeding (including the use of herbicides, especially mineral

oils), shading and sheltering, and protection against insects, other animal pests, and fungi. Lifting, grading, packing, storage, dispatch and handling of plants at destination. Price problems (in Germany). Social and political questions (labour supply, wages, insurance etc.).

Four final chapters, not summarized in English, describe in general terms afforestation measures and the special features of forestry and the timber industry in the U.S.A., the inauguration of the C. A. Schenck memorial Redwood grove in Oregon, and the author's general impressions of America.

3279. Tulstrup, N. P. Skovfrø. **[Forest seed.]** Dansk Skovforenings Frøudvalg [Springforbi]. 1952. pp. 70. [Dan.]

Contains sections, all with special reference to conditions in Denmark, on: the effect of internal and external factors on seed setting; seed collection; extraction; cleaning; storage; germination; sowing; species hybrids; provenance and climate and form races; and the Seed Committee of the Dansk Skovforening. There are tables showing, for a number of species: age of setting seed, time of flowering and seed collection, and the interval between good seed years; the weight and germination of seeds; and time of sowing, amount of seed required, and preparation of seed and seedbed. Subject and species indexes are provided.

232.31. *Seed*

See also Nos. 3278–9.

232.311. Seed Production (Seed Years, Seed Crops; Seed Orchards and Methods of Inducing Seed Production)

See also Nos. 3177–8.

3280. Wraber, M. Gojenje gozdov v luči genetike. **[Silviculture from the point of view of genetics.]** *Strok. znanst. Izd. gozd. Inst. Sloven.* No. 2, 1950. pp. 68 + 1 map. 29 refs. [Sloven. russ.f.]

Includes the following sections: seed husbandry—the first care of progressive forestry; problems of heredity and their significance in forestry; classical genetics and the teaching of Mičurin; application of genetics to seed production; criteria for the delimitation of seed-bearing stands.

232.312. Seed Collection, Extraction and Grading (including Seed Weight)

See also No. 3298

3281. Usher, G. A. **Tree-climbing: the case for the climbing chair.** *Quart. J. For.* 47 (2), 1953 (120–1 + 3 photos).

A modification of the boatswain's chair is described, a pair of which can be used as mobile steps for climbing any tree not exceeding 22 in. d.b.h. It is easy and cheap to make, simple and safe to use, does not damage the tree, can be used internodally and is not limited by height. It is light in weight, can be carried as a pack, is operated by one man, and permits the greatest amount of manoeuvre. It is particularly suited for use when pruning.

3282. Šnajperk, R. Trhačská souprava—vydatný pomocník při sklizni kvalitního osiva. **[Appliance for [tree-climbing as aid in] seed-collection—an efficient help in harvesting quality seeds.]** *Lesn. Práce* 32 (3), 1953 (118–23). [Cz.]

Illustrated description of a rope-ladder attached to a rope that is shot over a stout branch of the (conifer) tree by bow-and-arrow, and knotted round the stem. Only 3 min. 26 sec. are said to be required for hanging the ladder and for the cone-gatherer to ascend its 25-m. length. Whereas an operator with climbing irons can gather 15–22 kg. of cones from 5–6 Pine stems daily, a man with the bow-and-arrow ladder gathers 20–35 kg. from 8–10 stems.

3283. Cooper, R. W., and Schopmeyer, C. S. **Viability of Sand Pine seed.** *Res. Note Stheast. For. Exp. Sta.* No. 23, 1953. pp. 2.

Tests in 1950 with cone crops of 1945–9 showed a definite reduction in viability of sound seed with increasing age of cone. Seed from fresh cones collected in Sept., Oct. and Nov. 1950, showed a peak of viability between 10 Sept. and 10 Nov., probably reached during October.

3284. Sjöström, H. Ny vingnötare. **[New de-winging machine.]** *Skogen* 40 (4), 1953 (65). [Sw.]

Describes, with illustrations, the 'Fågelsjö'—a machine suitable for small extraction plants, designed and manufactured by Johan Dahlstedt, Fågelsjö. It consists of a drum (diam. and length both about 30 cm.) with a lining of thick soft rubber and 3 mats of rubber, mounted on springs on a central axle, that press against the wall of the drum as the axle rotates. The mats have a row of short rubber projections to spread the seed out. The machine can be worked by hand or run from a motor: a speed of 30–35 revs./min. has been found best. It is not continuous in action; small amounts of seed are treated at a time and the drum is emptied between the charges.

3285. Åkebrand, V. Frörensningstrumma: komplement till Hahnes avvingningsapparat. **[A seed-cleaning drum complementing Hahne's de-winging apparatus.]** *Skogen* 40 (6), 1953 (129, 135). [Sw.]

[Cf. *For. Abstr.* 14 (No. 2140).] The apparatus consists of a box 15 × 20 × 80 cm. with a fan at one side. Seed from the de-winging apparatus is caught in a funnel at the top and runs down a sloping wire screen (mesh 1·5 mm.) while empty seeds, dust and fragments are blown off by the fan blast and through a second wire screen that forms a trough with the first and guides the heavy seed through an opening in the bottom over a container. This has a further screen to catch pieces of cone and other particles too heavy to be blown away by the fan. Modifications to allow further screening of the seed into two quality classes are proposed. The apparatus is illustrated by a photograph and diagram.

3286. Dziedziniewicz, J. O získávání semen modřínu. **[Extraction of Larch seeds.]** *Lesn. Práce* 31 (8), 1952 (369–71). [Cz.]

Neither of the two methods of extracting Larch seeds commonly used gives satisfactory results: (1) the 'thermal' method (repeated drying and

humidification) takes a long time and does not extract all the seed; (2) 'mechanical' extraction gives a high % of impurities and damaged seed. Results are described of a novel method applied in 1949 and 1951 in the seed-extraction plant of Białogard (Poland). The usual type of iron extraction drum of 2·5 cu.m. capacity, with inner partitions, was used. Eight hl. of Larch cones of normal moisture content were put into the drum. A strong current of air at 50° C. was passed through the drum while it rotated continuously. After 3–4 hours, the cones began to open, and the first seeds were separated; these had undamaged wings. The remaining seeds were retained by the scales owing to the latter's elasticity as long as they were not dry. As drying proceeded, the scales became more rigid and abraded more readily, finally releasing the seeds; these were wingless, as the wings had been abraded along with the scales. After 61 hours complete extraction was achieved, and the drum content separated on screens and sieves into fine waste and a coarser fraction consisting of seeds, larger scale fragments and small cones. The final product obtained after a centrifugal separation of larger impurities, was 70–70·8% pure seeds, with only 0·8% damaged. Their germination varied between 25 and 44%; and germinative energy between 20 and 40%. The yield varied from 1·71 to 6·1 kg. seed/100 kg. cones, depending upon cone quality. [The article is a translation from the Polish journal *Las Polski*.]

3287. Nordström, L. Klängning av svårklängd tallkott. **[Extraction of Pine cones that are difficult to extract.]** *Norrlands SkogsvFörb. Tidskr.* 1953 (1), (1–19). 28 refs. [Sw.sw.]

A number of methods of improving extraction by moistening the cones for varying periods after preliminary treatment in the extraction kiln are described. A method in which the cones are soaked for 15 min. and the extraction is then continued at a kiln temperature of 45° C. with good kiln ventilation, has given good results even on cones less than 2·5 cm. long from high altitudes in N. Sweden. Experiments showed that temperatures inside a cone thus soaked remained below the kiln temperature, reaching about 35° during the early period of extraction. In laboratory experiments to test the effect of the treatment on seed viability there was no evidence of reduction in viability, after a soaking and drying treatment—corresponding as closely as possible to conditions during extraction—had been carried out 10 times on each of a number of different lots of seed. Further experiments on higher extraction temperatures and on the effect of the treatment on keeping qualities are desirable. Literature on reducing the time needed to determine viability of seed is discussed. [Cf. *For. Abstr.* 11 (No. 244).]

232.315. Seed Storage and Treatment

See also Nos. 3295, 3331.

3288. Pravdin, L. F., and Filimonova, V. D. Vlijanie nizkih temperatur na žiznesposobnostj želudeï. **[The influence of low temperatures upon the viability of acorns.]** *Dokl. Akad. Nauk SSSR* 85 (4), 1952 (921–4). 3 refs. [Russ.russ.] A.P.B.

The authors' tests showed that: (1) Acorns stored at constant temperatures of + 5 to − 7° C. for 3–4 months gave laboratory germination %s of 94–100, whether or not the radicle had emerged (2–4 mm.) at the beginning of the storage period. At lower temperatures all acorns were killed. (2) Drying the acorns before storage to a moisture content of 47% of oven-dry weight, reduced their germination % after 60 days' storage at 0 or − 5° to 44 and 40% respectively. (3) Storage at + 5 to − 5° for 3–4 months had no significant effect on field germination % or on the growth of the resulting plants during their first year of life. It is concluded that autumn sowings may be made with safety in all climatic regions where winter soil temperatures at 6–8 cm. depth (the usual depth of covering) do not drop below − 5 to − 7°, or only do so for a very short time.

3289. Krstić, M. Doprinos proučavanju konzerviranja brestovog semena (*Ulmus campestris* L.). **[Storage of *U. campestris* seed.]** *Rad. Inst. nauč. Istraž. šum., Beograd* No. 1, 1950 (53–61). 5 refs. [Serb.serb.f.]

Presents results of an investigation on the maintenance of germinative capacity in seeds of *U. campestris*. The seeds were stored in 4 different rooms, using several kinds of vessels, making in all 16 different sets of conditions. Seeds stored in a laboratory heated in winter, in tightly stoppered glass jars or in a desiccator over $CaCl_2$, showed after 10 months a loss of germinative capacity amounting to 30–32% of the initial value; the remaining samples were irretrievably damaged. Air-dried seeds coated with paraffin wax lost their viability. It is concluded that a moderate temperature and low relative humidity are favourable for the storage of Elm seeds.

3290. Miegroet, M. van. Recherches sur la signification de quelques substances actives synthétiques pour la culture des plants forestiers. Communication no. 2: L'influence de quelques substances synthétiques sur la croissance des semis du pin sylvestre. **[Studies on the value of synthetic growth substances in the raising of forest plants. Communication No. 2: the influence of some synthetic growth substances on the growth of *Pinus sylvestris* seedlings.]** *Schweiz. Z. Forstw.* 104 (4/5), 1953 (137–54). 13 refs. [F.g.]

Seed of *P. sylvestris* was soaked for 48 hours at 17° C. in different concentrations ($A = 100$ mg., $B = 1$ mg., and $C = 0{\cdot}01$ mg./100 c.c. distilled water), and then sown in troughs in a mixture of peat and sand. Half the plants were taken up and measured after 6 weeks, and the other half after 5 months, the measurements taken being total length of plant, height above ground, and length of principal root. *dl*-α-amino-butyric acid and a mixture of amido-nicotinic acid and biotin gave no, or negative, results. Amino-propionic acid (β-alanine) in concentrations *B* and *C* had a positive and permanent effect on the length of the principal root and on the root weight, without any bad side effects. Nicotinic acid produced a precocious development in length of the principal root and a permanent increase in root weight accompanied, however, by a final reduction in height growth, at

all concentrations. Amido-nicotinic acid effected a permanent increase in the root weight, but at concentration *A* reduced height growth. Treatments with β-indolyl(3)-propionic acid (conc. *A* and *B*), indolyl(3)-acetic acid, and α-naphthylacetamide (conc. *B* and *C*) temporarily favoured the growth of the principal root; the first two of these also increased the root weight at all concentrations, while the last did so only at conc. *B*; all three, at conc. *A*, produced a final diminution in height growth. [Cf. *For. Abstr.* 14 (No. 2146).]

3291. KARLBERG, S. Om behandling av tall- och granfrö i groningsstimulerande syfte. [**Treatment of Pine and Spruce seed to stimulate germination.**] *Skr. K. Skogshögsk., Stockh.* No. 11, 1953. pp. 42. 85 refs. [Sw.e.] Price *Kr.*4.

In two field experiments, soaking caused an approximate increase of 30–60% in plant %. In a third experiment, when seed was sown in abnormally wet weather in July 1951, no increase in plant % resulted from soaking, but germination took place more rapidly. No significant difference could be found between results of soaking in water, HCl, and a phosphate and an acetate buffer, all with pH 5–6. Laboratory tests indicated that best results were obtained when the solution had a pH between 5 and 6. Poorer germination resulted from soaking in solutions with pH below 4. Spruce, but not Pine, seed soaked for 24 hr. gave better results than that soaked for 12 hr. No significant differences were found in rates of water absorption of the two species. After 12 hr. the water content was 80%, and after 24 hr. 90% of full capacity. Increasing the temperature of the soaking fluid from 2 to 20° C. may increase the rate of absorption, but differences are slight. Treating the seed with Germisan and the seedbeds with Kerol to prevent damping off, did not reduce germination. It is concluded that soaking Spruce and Pine seed at room temperature for 24 and 12 hr. respectively, will materially increase the plant % in the nursery. Results are statistically analysed and given in graphs and tables with Swedish and English legends.

3292. NORDSTRÖM, L. Vår försörjning med tallfrö med särskild hänsyn tagen till Norrlands höjdlägen. [**Our supply of Pine seed with special reference to high ground in Norrland.**] *Norrlands SkogsvFörb. Tidskr.* 1953 (1), (20–84). Many refs. [Sw.]

In laboratory tests to determine the reason for the low plant % (often only 10%) obtained in field sowings of Scots Pine, 36 plants were obtained after 40 days from 100 seeds, 10 seeds had begun to germinate, 6 were rotten and 47 were sound but had not germinated. The seeds had been sown in drills and covered with sand. Literature on the effect of light in stimulating seed growth is discussed. In a further experiment, seeds were sown in drills and covered with a sheet of glass to reduce evaporation, the glass being removed when most of the plants were touching it, and the drill then filled with sand. The plant % at 45 days was over 70 as against 20–25% for drill-sown sand-covered seeds. Seeds were given daylight treatment for 1 day (about 5 hours' sunlight) or treatment with ultra-violet light for 10–60 min., or were kept in the dark before sowing. The plant % for such seeds sown under a darkened cloche was: daylight treatment—about 65%; ultra-violet treatment for 60, 20 and 10 min.—50, 30 and 25%; kept in the dark—about 20%. Seeds stored in the dark but grown under an undarkened cloche had a plant % of about 70. Results of a further series of tests confirm the higher plant % from seeds, especially fresh seeds, grown in the light. In laboratory experiments reproducing as far as possible field conditions, seeds that had been kept in the sun for 3 days before sowing showed a plant % above that for seeds kept in the dark, the difference decreasing with increasing age of the seed. In a small field experiment all except the oldest (2-year-old) seed gave a higher plant % when exposed to light before sowing but the difference was less marked than in the laboratory. Possible causes for this were investigated and it was found that when seeds were shaken in a metal drum for different periods, reproducing damage caused by de-winging, there was an improvement in the germination %. When 300 seeds were shaken for 15 sec. and sown in drills without any light treatment, the plant % after 62 days with a fairly low soil temperature was over 30% compared with about 15% for untreated seed. Previous investigations, however, probably on better seed, damaged during de-winging, gave opposite results [cf. *For. Abstr.* 12 (No. 2886)]. Further experiments on the duration of light treatment of seeds are desirable. For practical use, however, the seeds should be spread in a single layer in direct sunlight for 3 days. They can be treated whenever there is suitable weather, not necessarily immediately before sowing, and the effect is obtained whether or not the light passes through glass. Seeds that have been considerably damaged by de-winging will show little or no growth stimulation as a result of the light treatment. [Cf. *For. Abstr.* 14 (No. 3181).]

3293. DOLJA, N. I. K voprosu o fiziologii prorastanija zarodyšeĭ semjan jasenja obyknovennogo. [**Physiology of embryo growth and germination of *Fraxinus excelsior*.**] *Dokl. Akad. Nauk SSSR* 88 (4), 1953 (729–32). 6 refs. [Russ.] A.P.B.

Gives the results of some studies made in 1951–2 of the breaking of dormancy of Ash seed. (1) Seed collected near Kharkov in Oct. 1949, 1950 and 1951 was stored 'under dry conditions' [not further specified] for various periods, and tests were then made of the germination of excised embryos in Petri dishes at 22–25° C. and constant moisture. Embryos from seed stored dry for 1 month began to grow on the 15th day but after 35 days only 14% were growing, and after 90 days 20–25% were still dormant. Embryos from seed stored for 13 months started growth on the 10th day and by the 40th all were growing. Embryos from seed stored for 25 months were all growing by the 30th day. After storage periods of less than 3 months, growth of the excised embryos was uneven—the cotyledon in contact with the filter paper starting earlier and growing faster than the other; whereas after longer storage, both cotyledons grew simultaneously. None of these embryos showed any radicle growth, even after 120 days in the germinator; but 95% of

embryos from dried seed collected in the Yalta district, Crimea, showed simultaneous growth of radicle and cotyledons after 5 days, the remaining 5% starting growth of cotyledons alone. (2) Simultaneous growth of cotyledons and radicle in seed from the steppe and forest steppe zones requires previous stratification, the complete breaking of dormancy depending on a period of maintenance under moist conditions at (*a*) 18–20° followed by (*b*) 1–4°. During (*a*), which lasts 2–4 months according to seed origin and other biological characters of the seed, the embryos in the seed grew until they occupied ca. 4/5 of the length of the endosperm. Seed was kept in this stage for 430 days without germinating, and excised embryos from such seed showed growth of cotyledons only. When treatment (*b*) was given alone, no growth occurred within the seed: excised embryos placed in the germinator mostly showed cotyledon growth but none of the radicle, the latter occurring only in embryos that already occupied 4/5 of the endosperm length before excision. (3) In practice, good results are obtained when seed collected in August is sown or stratified soon after collection, since this assures the appropriate temperature régime for breaking dormancy.

232.318. Seed Testing. Germination Tests. Seed Quality.

See also Nos. 3181, 3293, 3304.

3294. Šimák, M., and Gustafsson, Å. Röntgenfotografering av skogsträdsfrö. **[X-ray photography of forest tree seeds.]** *Skogen* 40 (5*), 1953 (58*–61*). [Sw.]

Photographs were taken with contact therapy apparatus, Schönander TEA–25, on different types of film and plate. The seeds were stuck on strips of adhesive tape for photographing: seeds from different cones were kept separate and could easily be removed from the tape afterwards. Tests showed that seeds were damaged at 900–1000 R-units for Pine, 600–900 for Spruce, and 5000 for *Alnus glutinosa*, as against figures ranging from 5000 to over 100,000 units for seeds of field crops. The values used during the X-ray photography, however, were well below the danger point, generally only 50 or at most 100 units. Some of the results for seeds of Spruce, Pine, *Alnus* spp., Siberian Larch, and *Thuja plicata* of different provenances are illustrated in photographs, giving particulars of film, exposure etc. They show that the following can be determined: % of empty seeds; number of seeds with endosperm but no embryo; number of seeds with endosperm and embryo but in different stages of development; abnormalities in seeds; and the length of the embryo, which by the embryo-ratio method can be used as an index of viability.

3295. Prats Zapirain, M. Análisis y conservación de las semillas de coníferas mas empleadas en España. (Con un apéndice sobre daños producidos por insectos en las semillas forestales por el Entomólogo D. Eduardo Zarco). **[Testing and storage of seed of conifers most used in Spain. (With an appendix by D. Eduardo Zarco on damage to forest seed by insects).]** Servicio de Semillas, Instituto Forestal de Investigaciones y Experiencias, Ministerio de Agricultura, Madrid. 1950. pp. 52. 5 refs. [Span.]

Information on methods of identifying seeds by means of morphology and dimensions (with particular reference to 6 *Pinus* spp.), the taking of samples, testing for purity by weight, making germination tests, determining moisture content, and storage.

3296. Dalmady, J. Upotrebitel'nost' červivého žalud'u. **[Utilization of worm-eaten acorns.]** *Lesn. Práce* 32 (3), 1953 (116–7). [Slovak.slovak.]

Presents the results of 3 sowings of 1951-harvest acorns: (1) Sound, flotation-tested acorns had a germination of 80%; outwardly sound, but rejected by flotation test, 70%; worm-eaten, damaged near the germ, 30%. (2) Worm-eaten acorns had a germination equal to 75% of that of sound acorns. (3) Germination of sound acorns was 17%; of outwardly sound, but rejected in flotation, 13·5%; worm-eaten, with undamaged germ, 10·5%; worm-eaten with damaged germ, 9%.

232.32. *Plant Rearing. Nursery Practice*

See also Nos. 3251, 3262, 3266.

3297. Macdonald, J. **Recent developments in forest nursery practice in Great Britain.** *Quart. J. For.* 47 (2), 1953 (89–100 + 7 photos). 12 refs.

A paper read to the British Association in 1952. Developments during the past 20 years are described under three main heads—the maintenance of fertility in the nursery, weed control, and methods of cheapening production.

3298. Penfold, H. M. **Tree nursery practices at Keepit Dam [, New South Wales].** *J. Soil Conserv. N.S.W.* 9 (2), 1953 (92–7).

Notes on seed collection (*Eucalyptus* spp. and *Callitris glauca*), raising seedlings, tubing, and transplanting.

3299. Krébes, G. K otázke lesnych školiek a produkcie sadeníc. **[Forest nurseries and production of plants.]** *Pol'ana* 8 (5), 1952 (78–80.) [Slovak.]

Illustrates the productivity of the average forest nursery in Slovakia from 2 medium-sized nurseries near Šaštin totalling 0·5537 ha., with productive area 0·3717 ha. of which 0·0260 ha. was under fallow. Annual plant production for 1950–1 was: (1) Yearlings: Oak, 32,500; *Acer pseudoplatanus* 19,000; *Tilia cordata*, 28,250; Aspen, 29,000; *Ulmus glabra*, 18,250; *Fraxinus excelsior*, 6000; *Prunus avium*, 6000; (2) *Alnus glutinosa*, 1 and 2 years, 115,500; *A. incana*, 1500; *Populus*, 2 years, 1500; Spruce, 2 years, 6500; total plants 260,000, equivalent to 476,800 per ha. of total area, and 710,250/ha. of productive area. The average production in the whole of Slovakia was 233,000 viable plants per ha. in 1951, the highest figures being obtained with nurseries of 0·4–0·7 ha.

3300. Pourtet, J. Quelques règles pour la culture des peupliers noirs en pépinière et leur mise en place. **[Some rules for the raising of Black Poplars in the nursery and their planting out.]** *Rev. for. franç.* 5 (3), 1953 (352–9). [F.]

232.322. Preparation and Treatment of Soil, including Maintenance of Fertility

See also No. 3314.

3301. Stoeckeler, J. H. **Lupines as a nursery soil improvement crop.** *Tech. Note Lake St. For. Exp. Sta.* No. 395, 1953. pp. 1.

A number of *Lupinus* spp. were sown on 13 June, 1951 and measurements made in September to show average height, oven-dry weight/acre and N in entire crop/acre on limed and unlimed plots. Further tests in 1952 showed the superiority over other species of *L. angustifolius* especially in colder areas and higher altitudes.

3302. Reinhold, F. Basaltmehl als forstliches Düngemittel. **[Basalt meal as a forest fertilizer.]** Süddeutsche Basaltwerke, Immendingen, Baden. 1952. pp. 46. Many refs. [G.g.]

Reviews literature on trials to date, with discussion of reasons for the beneficial effects of basalt meal on e.g. poor diluvial sands and soils derived from bunter sandstone, the composition of basalt and basalt tuff from Immendingen, and comparison of costs with those of other fertilizers.

3303. Ando, A. **[The effects of fertilizers on the nutrient contents of Sugi (*Cryptomeria japonica*) seedlings.]** *Bull. Tokyo Univ. For.* No. 43, 1952 (91–100). 10 refs. [Jap.jap.e.]

Year-old seedlings in 3 beds given different amounts of mixed fertilizer (manure plus $(NH_4)_2SO_4$, P and K) were examined monthly from August to November, and contents of ash, N, P_2O_5, K_2O and CaO in shoots and roots were determined. (1) At the end of the growing season the contents were within the following limits: ash 6·0–6·5; N, 1·2–1·8; P_2O_5, 0·3–6·4; K_2O, 1·5–1·7 and CaO, 1·1–1·4%. (2) For each substance, change in quantity was more affected by the various stages of growth than by the amount of fertilizer applied. (3) (*a*) Content of N and CaO increased with the amounts of fertilizer given, but there was no clear change for P_2O_5 and K_2O. (*b*) The % of Ca varied least, both with season and with fertilizer. (*c*) For each substance, changes caused by the amount of fertilizer given were least in October. (*d*) The fertilizer caused an increase in P_2O_5 and decrease in water and N content of the root. (*e*) In November, the nutrient contents were in the following decreasing order: K_2O, N, CaO and P_2O_5; but with large amounts of fertilizer the N content was higher than that of K_2O. (4) With fertilizer the maximum intake of N was in October and of P_2O_5 and K_2O in September. (5) A relative increase of P_2O_5, K_2O and CaO and a decrease of N occurred in the root later in the growing season. With fertilizer there was a relative increase in content of ash and K_2O, and a decrease in content of water and N in the root, while CaO remained unchanged. *From author's summary.*

232.323. Sowing and Covering

See also No. 3288.

3304. Farrar, J. L., and Fraser, J. W. **A method of marking seed used in experiments.** *Silv. Leafl. For. Br. Can.* No. 71, 1952. pp. 1.

Quick-drying white enamel was applied with a brush to a piece of sheet metal in a horizontal position. Jack Pine seeds were sprinkled on the wet enamel, left until it dried, and then brushed off. Each seed was marked with a white spot on one side. Marked seed germinated as well as controls, and the ungerminated seeds were found still to be marked in the following spring after lying in the ground all the winter.

3305. Kobendza, R. Z biologii i ekologii kiełkowania nasion topoli. **[Biology and ecology of the germination of Poplar seeds.]** *Roczn. dendrol. polsk. Tow. bot., Warsz.* 8, 1952 (185–96). [Pol.russ.e.]

Poplar sowings conducted for several years by the author show that Poplars require much light during the germination period. While seedlings in the shade usually die, those that have germinated in shade and are then brought into the light must be protected against too much light until acclimatized. Seedlings grow much better under glass than in the open, but compost soil does not give favourable results; sandy loam with some humus is best, both for greenhouses and nurseries. The seeds can be sown with their pappus on, at an average distance of 1–2 cm. The best sowing time is the afternoon. On rainless days the seedlings should be watered daily at 4 p.m., at least during the first month. When being sown, the seeds should not be covered with soil, or the soil cover should be less than 1·5 mm. deep. Seedlings developed better in drills than on the adjacent even surface. The seed morphology and germination of *P. angulata*, *P. berolinensis*, and *P. nigra* are discussed.

3306. Budke, A. Skúsenosti s pestovaním osikových a brezových sadeníc. **[Experience with the rearing of Aspen and Birch plants.]** *Pol'ana* 8 (5), 1952 (80–1). [Slovak.]

Twigs 40 cm. long with ripe catkins were cut from Aspen trees on the day when down appeared on them (2–5 May in Slovakia), and immediately stuck into beds so as to secure natural seedfall. The beds, previously treated with compost and raked, were shaded with Spruce branches. The seedlings required only moderate watering but were sprayed frequently with 1% Bordeaux mixture. The first transplanting took place from 21 to 27 June, at 10 × 5 cm. spacing, the transplants being watered twice daily. Excellent results were obtained.

Birch seed was mixed with compost and sown densely in August, 1951, in rows 10 cm. apart. Results, up to late autumn were unpromising.

3307. Mork, E. Forsøk med forskjellige såtykkelser og planteavstander for gran i Kvatninga planteskole. **[Experiments with different sowing densities and spacings for Norway Spruce in Kvatninga forest nursery.]** *Medd. norske Skogforsøksv.* 11 (3) (No. 40), 1952 (527–67). 9 refs. [Nor.e.]

Seeds were sown in drills, at densities of 3, 6 and 12 g./linear m. in 1948. In spring 1950 all plants of 6 cm. and over were moved to transplant beds at spacings, within the rows, of 2·5, 3·5, 5·0, 7·5 and 10·0 cm. for each density. In autumn 1951 these plants were lifted, washed and dried and various measurements were made. In all, 1800 plants were

examined and the figures obtained were analysed statistically. Results, shown in tables with English and Norwegian legends, include the following: (1) The tallest 4-year plants were obtained from transplants from the sowing density of 6 g./m. and the same density gave the highest total, root, and above-ground weights. (2) This effect, however, was significant only for plant spacings of 10 cm. (3) Height differences between the 4-year plants from different spacings and same sowing density were slight. (4) For spacings of 2·5–7·5 cm. there was little difference in the weight of the above-ground parts but the 10-cm. spacing gave heavier plants. (5) Root weight increased with increasing plant spacing, that for a spacing of 3·5 cm. being 30% above that for one of 2·5 cm. (6) The roots of 4-year plants from the highest sowing densities were shorter than those from the lowest and medium densities. Root length appeared to increase with spacing. (7) An analysis of costs showed that the costs of transplanting, fertilizing and weeding increased by about 35% when spacing was increased from 2·5 to 3·5 cm. Definite recommendations must await field observations on survival and height increment of plants from the different spacings.

3308. **Seedbed density affects Longleaf height growth.** *Rep. Sth. For. Exp. Sta. 1952* [1953?] (6–7).

Measurements of seedlings from seedbed densities of 12, 22, 33 and 42 seedlings/sq. ft. showed, 2 years after planting out on a moderately severe site, average heights increasing with decreasing plant density, and ranging from 2·3 from the greatest to 4·8 in. for the smallest seedbed density. Similár results were obtained for seedlings from seedbed densities ranging from 12 to 59/sq. ft. and planted in an old field. These seedlings were grown on good nursery soils, and differences between heights of seedlings from different seedbed densities were less marked when the nursery soils were poorer.

3309. Yamahata, K. [**Nursery treatment of *Aleurites fordii* and *Sapium sebiferum*. (2) A study on the number of seedlings per unit area.**] *J. Jap. For. Soc.* 34 (4), 1952 (107–10). 3 refs. [Jap.e.]

Results given in tables and drawings with English legends show that for both species 20–30 seedlings/sq. m. is the optimum working density. Densities exceeding 60/sq. m. give bent stems and deformed root systems, especially with *S. sebiferum*.

3310. Petrović, D. S. Dubinsko sejanje šumskog semenja. [**Deep sowing of forest seeds.**] *Rad. Inst. nauč. Istraz. šum., Beograd* No. 1, 1950 (27–52). [Serb.f.]

Presents the results of sowings of *Pinus nigra* in the Košutnjak nursery of the Forest Research Institute of Belgrade in 1947. The sowings were made on: 26–7 March, 4, 16, and 28 April, the sowing depths being 1, 2, 3 . . . 8 cm., and the quantities sown 100, 200 . . . 1000 seeds/1-m. drill (10 drills for each depth). The beds were not watered. In spite of some inconsistencies in the results, it is concluded that *P. nigra* will germinate from as deep as 8 cm.; early sowing is favourable, so far as germination % and first-year seedling survival are concerned; and the germination and survival % increase with depth. The effect of density of sowing is not clear. Similar tests in March and April 1948 at Košutnjak showed optimum germination for sowing depths between 3 and 7 cm. At Peć, also in March and April, the optimum depth was 2–4 cm.; these sowings were watered. Experiments in a greenhouse, at depths of 1–20 cm., showed that the germination % was several times greater with daily watering than with watering every fifth day; some plants germinated from a depth of 16 cm. and the optimum was 3–5 cm. Some results are also included of direct sowings of *P. nigra* in two different areas. Tests with seed of broadleaved trees (*Acer negundo*, *A. platanoides*, *A. pseudoplatanus*, *A. campestre*, *Fraxinus ornus* and *Gleditsia triacanthos*) showed that they germinate very well even from a depth of 12 cm., and nearly as well from lesser depths. Previous stratification usually improved the results. For *Morus alba* the optimum depth was 1–5 cm. and in another experiment 3–5 cm.

232.324. Transplanting and Lining Out, including Grading of Seedlings

3311. Haugberg, M. Noen resultater fra et lite sorteringsforsøk med 2/0 granplanter ved Institutt for Skogskjøtsel. [**Result of a small-scale trial on sorting 2 + 0 Spruce, by the Institutt for Skogskjøtsel.**] *Årsskr. norske Skogplantesk. 1952* [1953?] (67–74). 3 refs. [Nor.]

The plants were sorted into (1) large, (2) medium, (3) culls (below 5 cm. height), and (4) the best plants from (3). The resulting 2 + 2 plants of group (1) were significantly taller than the other groups; there were no significant differences in leader growth over 2 years; plants of group (1) were significantly heavier, but there were no significant differences in the weight relationship of top/root for the 4 groups. Discusses the validity of height as a criterion for discarding 2 + 0 plants and concludes that further research is needed.

3312. Milde, F. Prikling av gran i dets annet vekstår. [**Transplanting Spruce in its second growing season.**] *Årsskr. norske Skogplantesk. 1952* [1953?] (14–7). [Nor.]

In experiments at a Rogaland nursery, 700,000 Spruce (2 + 0) were transplanted between 25 April and 20 May before shoot growth began and 1,400,000 Spruce (1 + 0) between 24 May after shoot growth began and 30 August. Plants transplanted with a leader growth of 2–5 cm. drooped at first but soon recovered. Mortality was lower for 1 + 0 than for 2 + 0 plants. Plants with the best colour and growth habit were obtained from 1 + 0 Spruce of Harz provenance transplanted when shoot growth was at its maximum, and these showed stronger growth than 2 + 0 Spruce of Harz and Østfold provenances from neighbouring beds.

232.325. Tending (in both Seedbeds and Transplant Beds)

3313. Bylterud, A., and Vidme, T. Ugrasforsøk i skogplanteskoler, 1951–52. [**Weed control experiments in forest tree nurseries, 1951–2.**] *Årsskr. norske Skogplantesk. 1952* [1953?] (46–65). [Nor.e.]

[Cf. *For. Abstr.* 13 (No. 3781).] Reports on a small number of experiments from different nurseries suggest that spraying with white spirit, alone or with 10% sulphate turpentine, was less effective at noon than at 7 a.m. or 7 p.m. Seedbeds were sprayed 2 weeks after sowing; H_2SO_4, white spirit, and 10% sulphate turpentine in white spirit, did no damage to the germinating Pine or Spruce, but a mixture of white spirit with either pentachlorophenol or Pac (polychloraryl-alkyl-carbonate), though most effective against weeds, considerably reduced the number of conifer plants obtained; further research on concentration, rates of application and date of spraying is proposed. Seedbeds were sprayed with white spirit at rates of 50 and 100 litres/dekare 2 weeks after sowing, 4 days after seedling emergence and then at fortnightly intervals until 14 weeks after the second spraying; the 100 litre/dekare spraying was more effective against the weeds, and for both concentrations damage to Pine and Spruce was very slight, occurring only after spraying on 12 August, 6 weeks after the second spraying. General recommendations are made on the use of $FeSO_4$ and mineral oil of the white-spirit type. Weeds are grouped by their susceptibility to 75 litres mineral oil/dekare: susceptible species (75% killed)—*Poa annua*, *Stellaria media*, *Chenopodium album*, *Spergula arvensis*, *Galeopsis* spp., *Viola arvensis*, *Thlaspi arvense*, *Arenaria* spp., *Sagina procumbens*, *Rumex acetosella* and *Polygonum* spp.; intermediate species (50% killed)—*Fumaria officinalis*, *Lamium purpureum*, *Gnaphalium uliginosum*, *Capsella bursa-pastoris*, *Equisetum arvense*, *Erysimum cheiranthoides*, *Ranunculus repens*, and *Agropyron repens*; and resistant species (fewer than 25% killed)—*Matricaria inodora*, *M. matricarioides*, *Senecio vulgaris* and *Cirsium arvense*.

232.327. Protection Measures in Nurseries

See also Nos. 3316, 3475–7, 3515.

3314. Henry, B. W. **A root rot of Southern Pine nursery seedlings and its control by soil fumigation.** *Phytopathology* 43 (2), 1953 (81–8). 12 refs.

A root rot occurring at a U.S. Forest Service nursery near Brooklyn, Miss., killed large numbers of *Pinus taeda* and damaged *P. echinata* and *P. palustris*. *P. caribaea* was less susceptible. The cause of the rot was not discovered, but applications of 24 gal./acre of a 20%-by-volume solution of ethylene dibromide, 2–3 weeks before spring sowing, gave excellent control, and 2–3 successive annual treatments eliminated all damage to following Pine crops.

232.328. Vegetative Propagation

See also No. 3048.

3315. Rao, H. S. **Vegetative propagation and forest tree improvement.** *Indian For.* 79 (3), 1953 (176–83). 10 refs.

Gives lists of Indian tree species that can be reproduced by cuttings (74), layering (11), grafting or budding (9), root suckers (104), and coppicing (161).

3316. Doran, W. L. **Effects of treating cuttings of woody plants with both a root-inducing substance and a fungicide.** *Proc. Amer. Soc. hort. Sci.* 60, 1952 (487–91). 3 refs. E.M.B.

Treatment with a fungicide, Phygon XL (50% 2,3-dichloro-1,4-naphthoquinone), both diluted and undiluted, stimulated rooting. Phygon XL added to a root-inducing substance, intensified the latter's effect.

3317. Satoo, S. **[Origin and development of adventitious roots in cuttings from conifer seedlings (1).]** *Bull. Tokyo Univ. For.* No. 43, 1952 (59–81). 18 refs. [Jap.e.]

Cuttings were made from the epicotylic shoots of young seedlings (ranging from 2 to 14 months) of 8 species, and 5–15 cuttings were examined every few days after planting. The number of days from planting to the first observation of root primordia ranged from 6 to 32 and of visible roots from 16 to 48 for *Chamaecyparis pisifera* and *Abies firma* respectively. The development of the roots from ray or callus tissues is described for each species and illustrated with drawings. *From author's summary.*

3318. Miyajima, H. **[The relationship between races of *Cryptomeria japonica* and root formation of cuttings.]** *Repr.* from *Science Bulletin, Faculty of Agriculture, Kyushu University* 13 (1/4), 1951 (277–81). 3 refs. [Jap.e.]

The races Measa, Kurojin, Misugi, Ayasugi and Yabukuguri were studied in Latin squares, with the following results: (1) The % of well rooted cuttings varied from 42 to 92. (2) Ayasugi showed the highest % of both well rooted cuttings and transplants, whereas Yabukuguri, with a high % of well rooted cuttings, yielded a low % of transplants; the converse was true of Measa. (3) Nursery survival rate of all 5 races exceeded 95%. *From author's summary.*

3319. Chiba, S., and Kotani, S. **[Propagation of *Cryptomeria japonica* D. Don by small green shoot cuttings treated with a growth substance.]** *J. Jap. For. Soc.* 34 (8), 1952 (254–6). 5 refs. [Jap.e.]

Cuttings about 5 cm. long from a 10-year plant were treated with Kβ-indoleacetate in concentrations of 0·04, 0·12 and 0·20%, with water as a control. The use of the growth substance effectively shortened the rooting period and increased the rooting amount. The higher the concentration the better was the result except for cuttings taken in Oct.–Nov.

3320. Toda, R. **[The time for collecting cuttings of *Edgeworthia papyrifera* and the effect of growth-regulator treatment.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 57, 1952 (203–4). 1 ref. [Jap.e.]

Six collections were made between 8 Feb. and 26 April from 3 plants, and 10 cuttings from each collection and plant were soaked for 20 hr. in 0·04 and 0·02% concentrations of K α-naphthaleneacetate or in water. Cuttings were examined in mid-June. Results are shown in graphs. Collection in early March gave best and in April worst rooting. On the whole, the treatment with the growth substance failed to increase the number of rooted cuttings but increased the number of roots per cutting. *From author's summary.*

3321. Hyodo, M., and Yamawaki, I. **[The propagation of *Edgeworthia papyrifera* (Kochi**

race) by buried stem cuttings. (Preliminary report).] *J. Jap. For. Soc.* 34 (3), 1952 (82–4). [Jap.e.]

The following results were obtained:—(1) Cuttings over 10 cm. long and 4 mm. diameter rooted 80% or more. (2) The number of shoots increased with increasing diameter. (3) Shoots were 4–8 cm. long at end of one season's growth. (4) There were 1–4 shoots per cutting on 99% of the cuttings. *From authors' summary.*

3322. TOMINAGA, K. **[The propagation of *Edgeworthia papyrifera* by stem cuttings in a temporary nursery in the forest.]** *J. Jap. For. Soc.* 34 (4), 1952 (105–6). 2 refs. [Jap.e.]

The rooting of both Kochi and Shizuoka races reached at least 80% for cuttings 15 cm. long and over 10 mm. in diameter. The high rooting % is attributed to the high humidity in the forest (13% higher than that outside). *From author's summary.*

3323. REINDERS-GOUWENTAK, C. A. **Vegetative propagation of *Populus* cuttings from South Africa in spring in the Netherlands.** *Proc. ned. Akad. Wet.* 56*C* (1), 1953 (66–70). 4 refs. [E.e.] O.R.S.

Cuttings of *Populus deltoides* from S. Africa were given the following 4 treatments: (1) breaking of dormancy by overnight treatment with vapour of ethylene chlorohydrin and subsequent growth-regulator treatment in a solution of 60 p.p.m. of the Na salt of indole-3-acetic acid; (2) dormancy broken, no growth-regulator treatment; (3) dormancy not broken, growth-regulator treatment; and (4) untreated controls. All cuttings were planted in a mixture of peat and sand, kept in darkness for 14 days at 20–22° C. and relative humidity 75%, and then grown normally in the greenhouse in the natural long day-lengths of the Dutch spring and summer. Best shoot and root formation was obtained by treatment (1).

3324. REINDERS - GOUWENTAK, C. A., and SIPKENS, J. **The influence of photoperiod, dormancy breaking and growth hormone treatment on Poplar cuttings.** *Proc. ned. Akad. Wet.* 56*C* (1), 1953 (71–80). 6 refs. [E.e.] O.R.S.

In connexion with research on rooting of Poplar cuttings from S. Africa [cf. preceding abstract] investigations were made on cuttings of *P. robusta* from normal long-day material and from trees grown from May to autumn 1951 in an artificially shortened day. The experiments were carried out in February and March when the natural day length was below 12hr. and 4 treatments were given: (1) complete darkness for 14 days followed by 16-hr. days using TL (fluorescent) light to supplement the normal daylight; (2) short day (normal daylight); (3) and (4) 16-hr. day of normal daylight supplemented with incandescent or TL light respectively. Cuttings were given different combinations of rest-breaking treatment by a hot-water method and treatment with the Na salt of heteroauxin. With the material from short-day parent trees, best results were obtained from cuttings given both rest-breaking and heteroauxin treatment and day-length treatment (1). Cuttings from long-day material gave the best shoot development after day-length treatment (1), and this is the recommended treatment, but the largest number of roots developed after long-day treatment. The number of roots per cutting was always greater in cuttings from long-day than from short-day parent material.

3325. REINDERS-GOUWENTAK, C. A. **Problems in vegetative propagation of *Populus*.** *Proc. ned. Akad. Wet.* 56*C* (2), 1953 (202–5). 6 refs. [E.e.] O.R.S.

Further experiments with *P. robusta* confirm the better rooting obtained from cuttings kept for 14 days in darkness and then given long-day treatment. [Cf. preceding abstract.]

3326. BORISENKO, T. T. O vozmožnosti vegetativnogo razmnoženija duba odnouzlovymi čerenkami. **[The possibility of vegetative propagation of Oak by uninodal cuttings.]** *Dokl. Akad. Nauk SSSR* 86 (5), 1952 (1045–8). 5 refs. [Russ.] A.P.B.

Reports on experiments made in the Kirovograd region, Ukraine. Uninodal cuttings 1–1·5 cm. long, bearing 1 leaf and its axillary bud, were cut from healthy 1-year-old plants of *Quercus robur*. The leaf apices (½–⅓ of the leaf) were trimmed off and the basal cross-section of the cutting treated with a dust containing 30 mg. α-naphthyl-acetic acid in 10 g. talc. Controls were dusted with talc alone. All were then planted immediately (3 June 1951) in a frame, with their bud projecting above the sand. For the first month high humidity was maintained by watering thrice daily; the frame temperature did not exceed 30° C. As rooting proceeded, the cuttings were gradually hardened off. By 3 Aug. treated and control cuttings showed respectively 70 and 35% rooted, 20 and 25% callused but unrooted, and 10 and 40% dead. By 28 Sept. these figures were unchanged for the treated cuttings, which after rooting had formed shoots carrying 4–5 leaves and a terminal bud; in the controls, however, mortality had increased to 50% leaving 30 rooted and 20 callused only. Treated cuttings had more, thicker and larger roots than controls.

A parallel series of experiments with uninodal cuttings from older plants, under otherwise identical conditions, showed that rooting capacity decreases rapidly with age; treated cuttings and controls from 4-year-old plants, showed respectively 45 and 20% rooting and those from 7-year-old plants only 20 and 5%.

3327. WELLENSIEK, S. J. **Rejuvenation of woody plants by formation of sphaeroblasts.** *Proc. ned. Akad. Wet.* 55*C* (5), 1952 (567–73 + 3 photos). 10 refs. [E.e.] O.R.S.

Disbudding was used to produce sphaeroblasts, mainly on Apple and Pear, for which results are discussed in detail. Sphaeroblast shoots were found to have rooting capacity, but further experiments will be needed to determine the rooting %. A small-scale experiment on Beech, Birch and Oak was made in 1951, all species forming sphaeroblasts with adventitious buds and shoots. Oak gave the best results.

3328. TODA, R. **Rooting ability of Pine [*Pinus densiflora*] leaf-bundle cuttings can be improved by environmental control before their collection.** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 57, 1952 (205–8). 8 refs. [E.jap.]

Considerable differences were found in the rooting capacity of leaf bundles [cf. Toda, R., *Bull. Tokyo Univ. For.*, No. 36, 1948 (41–8)] from twigs that had been covered with red or blue cellophane bags for different periods and from uncovered controls, but the nature of the factors involved is not clear.

232.329. Miscellaneous (including Greenhouses, Frames, Raising in Pots, Tubes etc.)

See also No. 3251.

3329. Hawkins, J., and Cameron, D. I. **Effect of galvanized iron on some tree seedlings.** *Nature, Lond.* 171 (4361), 1953 (977–8). [Research Laboratories, Lysaght's Works Pty., Ltd., P.O. Newcastle 2N, N.S.W.]

Shortage of tin-plate has led to the use in Australia of galvanized-iron tubes for raising seedlings. Some species appear to be unaffected by the change, but others (including *Acacia spectabilis*, *Callitris cupressiformis*, *Casuarina suberosa*, *Eucalyptus grandis*, and *Melaleuca hypericifolia*) showed a yellowing of the foliage, stunting of growth, and, in some cases, death of the seedling after 6 months or more. Root growth was normal, in these species, until the roots reached the tube, when further growth ceased, followed by progressive dying back of the roots until only those running straight downwards remained alive. A similar, but slower, effect was seen in the roots of species that appeared to be unaffected above ground, such as *Acacia decurrens*, *Casuarina cunninghamii*, *Eucalyptus saligna*, *Melaleuca bracteata*, and *Tristania conferta*. Affected seedlings, transplanted in time, may recover, and there is some evidence that excessive watering may aggravate the trouble. Rusty tin-plate or uncoated steel tubes, whether rusty or not, are satisfactory.

232.33. *Formation of Stands by Direct Sowing*

See also Nos. 3251, 3288, 3304, 3394, 3427, 3502–3.

3330. Leslie, A. P. **Direct seeding as a means of reforestation.** *Pulp Paper Mag. Can.* 54 (5), 1953 (180 . . . 188). 83 refs. (*Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1298 (*F*2).)

Reviews literature and discusses briefly two recent experiments with direct sowing in Ontario.

3331. **Direct seeding of Loblolly Pine in Central Louisiana.** *Rep. Sth. For. Exp. Sta. 1952* [1953?] (9–10).

Figures showing seedlings/acre in June and Nov., 1952, from stratified and unstratified seed sown in March 1952 on sites given different preparatory treatment are tabulated. Disking or, on sites with heavy grass cover, burning and disking improved the number of seedlings. Direct seeding on light grass cover or on freshly burned heavy grass cover gave a good crop of seedlings and fair first-year survival, but many were smothered in rank grass and further survival seemed improbable. Stratification improved the results. [Cf. *For. Abstr.* 14 (No. 2145).]

3332. Kallander, R. M., and Berry, D. **Aerial seeding: the methods and techniques employed by the Oregon State Board of Forestry.** *Res. Bull. Ore. Bd. For.* No. 7, 1953. pp. 53. 8 refs.

Recommends methods based on a series of experiments [cf. *For. Abstr.* 14 (No. 2190)], including baiting for rodent control, seed application, use of helicopters etc. The minimum economic area is given as 500 acres. Results of each project to date are summarized.

3333. Sirén, G. Havaintoja Peräpohjolan valtion mailla vuosina 1948–50 suoritetuista männyn kylvöistä. **[Observations on direct sowing of *Pinus sylvestris* on state-owned land in the north of Finland in 1948–50.]** *Silva fenn.* No. 78, 1952. pp. 40. 44 refs. [Fi.e.]

A detailed account of a survey made to determine the causes of failure of direct sowings of Scots Pine in the state forests of Peräpohjola. The following conclusions are reached. On all sites with a thick humus layer, thorough burning should be carried out in the summer before sowing. The best time for sowing is about mid-June. Seed spots must be prepared by removing the humus down to, but without disturbing, the A-horizon. The seed must be pressed in and covered by 0·5 cm. of soil or powdered humus. The great extent of the area involved is such, however, that the author doubts the practical possibility of regenerating it all in this way and suggests that the solution of the problem may be large-scale burning followed by broadcast sowing from aircraft.

232.4. Formation of Stands by Planting

See also Nos. 3251, 3262.

232.41. *Planting Stock (Type, Handling and Treatment)*

3334. **[Clipping and dipping Longleaf Pine seedlings.]** *Rep. Sth. For. Exp. Sta. 1952* [1953?] (10–4). [Cf. *For. Abstr.* 12 (No. 2903).] Extensive tests in 1951–2 in a number of widely separated plantings showed an increase of 10–20% in early survival of seedlings with needles clipped to 5 in., and the treatment is recommended as standard nursery practice. Seedlings dipped in a wax emulsion (1 : 3 concentration of Dowax) generally survived better, but in one case less well, than untreated seedlings; the treatment is recommended only for experimental use until the conditions in which it is harmful have been determined. In a test on large and average seedlings (diam. at the root collar greater or less than ½ in.) clipping and dipping improved survival regardless of site (freshly burned or in 1-year cover). Seedlings that had been clipped to 5 in., dipped in Dowax emulsion, given both treatments, or left untreated, were stored for 1, 3, 6 and 15 days before planting. Storage for 15 days reduced the survival at 4 months after planting, of all treated seedlings from 77 to 55% and of untreated seedlings from 60 to 40%. Differences between the different treatments were not significant. The average survival of all seedlings stored for 1, 3, 7 and 15 days was 77, 74, 72 and 52%.

232.42. *Methods of Planting (including Use of Fertilizers etc.)*

See also Nos. 3302, 3427.

3335. Holubčik, M. Skúsenosti z jarného zalesňovania. **[Experience from spring afforestation.]** *Pol'ana* 8 (7/8), 1952 (127–9). [Slovak.]

Illustrated description of a planting tool and its variants designed by Burgan and used since 1950 at Smolnicka Huta for notch planting. Total length of the prototype is ca. 95 cm., the handle being of iron piping 4 cm. in diam. while the blade is a tapering steel plate, 1·5 cm. thick and 8–13 cm. wide at the junction with the handle, and 23–35 cm. long. The tools work satisfactorily even on the heavier soils. The correct method of making the notch and closing it after inserting the plant is described and illustrated. A maximum rate of 1 plant/18 sec. is said to be obtainable.

3336. Cole, R. **Using a posthole digger for planting.** *Quart. J. For.* 47 (2), 1953 (135–6).

Use of a 12-in. auger mounted on a standard International Farmall 'M' tractor gave good results on stony ground at Ashridge. At 6-ft. spacing, 2 men could plant an acre in 20 hours compared with 48 hours using mattocks. The only disadvantage appears to be that it is impossible to preserve absolutely square planting.

232.43. *Spacing and Arrangement in Plantations*

See also No. 3265.

3337. Senda, S., Nakamura, K., Takahara, S., and Satoo, T. **[Some aspects of growth in stands (a preliminary report): an analysis of Pine stands with different spacings.]** *Bull. Tokyo Univ. For.* No. 43, 1952 (49–57). 10 refs. [Jap.e.]

A survey was made in 1950 on approximately comparable plots planted in 1938 with 1-year seedlings of *Pinus densiflora*, using spacings of 0·5, 1·0, 1·5 or 2·0 m. The following results were obtained: (1) Average d.b.h., size of crown, live-crown ratio, stem-wood volume, weight of needles per tree, and volume of branches per tree and per unit area, decreased with increasing stand density. (2) Mortality, volume of stem-wood and basal area at b.h./unit area, annual stem-wood production/unit weight of needles, and ratio of stem-wood to total wood (stem + branches) increased with increasing stand density. (3) Volume of total wood, amount of needles/unit area and height were not affected by stand density. It is concluded from these results that the volume of total wood in a young Pine stand is not affected by stand density, but that the stem-wood % increases with increasing density. [Tables and graphs have English text.] *From authors' summary.*

3338. Klem, G. G. Planteavstands virkning på granvirkets kvalitet. **[The effect of plant spacing on the quality of Spruce timber.]** *Medd. norske Skogsforsøksv.* 11 (3) (No. 40), 1952 (473–506). 4 refs. [Nor.nor.e.]

In continuation of a previous study [cf. *For. Abstr.* 5 (p.253)] measurements were made on 3 representative trees from each of the following spacings: 1·25 × 1·40 m. (referred to as 1·3 m.), 1·40 × 1·65 m. (1·5 m.), 2 × 2 m., 3 × 3 m., and 3·5 × 3·5 m. Ages ranged from 46 to 50 years. The results (given in graphs and tables with legends in Norwegian and English) show that: (1) For 1940, the number of knots increased with increasing spacing, but by 1951 the difference between spacings was insignificant. (2) Differences in sp. gr. between the spacings were more pronounced in 1940 than in 1951. By 1951, the sp. gr. of the 1·5- and 2-m. trees was very close, and that from the 3·5-m. spacing rather lower (results for the 3-m. spacing are throughout not comparable, because of site differences). In 1940 an outer zone with narrow rings was less frequent in the open than in the close spacings. By 1951 a wide outer zone of narrow-ringed wood was found in all spacings. (3) No relationship was found between the content of lignin or ether extractives and tree spacing, nor did any definite change occur between 1940 and 1951. (4) The annual ring width, latewood % and sp. gr. for the inner zone were the same for all spacings. In the outer zone, latewood increased with decreasing ring width but the relationship of sp. gr. to latewood % and ring width is not clear. (5) Figures for taper of whole trees for 1930, 1940 and 1951 show a steady equalization between trees from the different spacings. In butt logs in 1951 there was little difference between the spacings; in middle logs a slight increase of taper and in top logs a large increase, with increasing spacing. (6) The total yield of dry matter (kg./ha., obtained by multiplying the cumulative increment in cu.m. by [green?] density) up to 44 years, decreased with increased spacing, the yield for the 2-m. spacing being 91% and for 3·5-m. 69% of that for the 1·5-m. spacings. As the stands closed, however, the differences decreased and volume increment for 1940–9 and 1947–9 was very similar for all spacings. (7) Timber quality decreased with increasing spacing. The 1·3- and 1·5-m. gave roughly the same number of boards in grades A and B, the 2-m. gave only grade B and the 3- and 3·5-m. gave grades B and C. All reductions in grade were caused by knots.

233. *Afforestation*

See also Nos. 3010–6, 3148, 3252, 4029–31.

3339. Rupert, P. Jedna racionalna metoda pošumljavanja lakih tala. **[A rational method of afforesting light soils.]** *Šum. List* 76 (12), 1952 (451–8). [Croat.g.]

Suggests a method for their afforestation with *Robinia pseudoacacia.* This is planted in rows, at 1- to 1·5-m. spacing in, and 10-m. between, rows. The length of roots of this species on medium-quality soils is equal to stem height; hence when the height attains 5 m. (roughly after 5 years), the soil between the rows is ploughed up at 2-m. intervals, giving 4 furrows between rows. The cut or wounded roots develop root suckers. After ploughing, the original stems are felled groupwise to assure better development of root suckers and make the stand even-aged. It is claimed that this method reduces the cost of afforestation by 75%. The same method can be used to obtain uneven-aged *Robinia* stands. The first furrows are made at 2-m. distance on either side of the original row 2–3 years after planting, the subsequent furrows following at 2-m. intervals every 1–2 years.

3340. Friedrich, A. G. Die Aufforstungsergebnisse der Provinzialforstverwaltung unter Emeis in Südschleswig, ein Beispiel erfolgreicher Ödlandbewaldung. **[The results of afforestation work by the Provincial Forest Administration, under**

C. Emeis, in S. Schleswig: **an example of successful waste-land afforestation.**] *Mitteilungen aus dem Institut für Raumforschung Bonn, Bad Godesberg* No. 12, [1952]. pp. v. + 43. 62 refs. [G.]

Extracts from a special study made in 1949–50 of the plantations established in the 1880's, chiefly on heathland, with chapters on the region, its site factors, history, afforestation technique, mensurational data and an appraisal of the suitability of the species used (native and exotic hardwoods and conifers, mostly as mixtures) with special reference to maintenance of yield and to adequacy of root systems, and a discussion of future afforestation policy.

3341. Morandini, R. Il pino uncinato nei rimboschimenti. [**The use of *Pinus mugo* var. *uncinata* in afforestation.**] *Monti e Boschi* 4 (2), 1953 (72–3). 2 refs. [It.f.e.]

After emphasizing the necessity for a clear distinction between the different varieties and forms of *Pinus mugo* [cf. *For. Abstr.* 13 (No. 998)] the author discusses the value of *P. mugo* var. *uncinata* for afforestation in the mountains.

3342. Agostini, R. Aspetti pedologici e fitosociologici dei monti Somma e Vesuvio nei confronti della loro sistemazione idraulico-forestale. [**Pedological and phytosociological aspects of Mt. Somma and Mt. Vesuvius in relation to their hydrological and silvicultural management.**] *Ital. for. mont.* 8 (1), 1953 (22–33). 14 refs. [It.it.f.]

Describes the (mainly volcanic) soils and the natural vegetation of the two mountains and discusses afforestation in relation to hydrology. Sowing of Broom, planting of Robinia, direct sowing and planting of seedlings of *Pinus pinaster* and *P. nigra*, and direct sowing of *Quercus ilex* are recommended.

3343. Saatçioğlu, F. Türkiyede ağaçlandırmanın önemine ve problemlerine toplu bakış. [**The importance and problems of afforestation in Turkey.**] *Istanbul Üniv. Orm. Fak. Derg.* 2*A* (1), 1952 (60–82) 9 refs. [Turk.g.e.]

The areas in need of afforestation are: burnt areas, degraded areas, bushland or maquis, and treeless steppes. The burnt areas, created in 1937–50, cover about 709,000 ha. Natural regeneration is inadequate, only 5% of the areas in Dursunbey (W. Anatolia) having regenerated naturally to date. With artificial regeneration in this area the best results have been obtained with 2-year transplants of *Pinus nigra* var. *caramanica* and *P. sylvestris* and 4-year transplants of *Abies bornmülleriana*. Sowing is 30–40% cheaper than planting, but is not advisable in regions with prolonged summer drought. The degraded areas, comprising over half the forests of Turkey, are the results of illegal and unregulated felling. In degraded areas with mixed Oak, Chestnut and Hornbeam in Belgrade forest, afforestation with 2- to 3-year transplants of *Pinus nigra*, *P. sylvestris*, *P. halepensis* var. *brutia* and *Cedrus*, 1-year *P. pinea* and 4-year Fir, and sowings of Oak and Beech have been successful. In the maquis, 3-year *P. nigra* planted at 1·5 × 1·5 m. in cleared patches have given good results. *P. halepensis* var. *brutia*, *P. pinea*, *Cupressus sempervirens* var. *horizontalis*, *C. arizonica* and *Quercus* spp., and for high grounds *P. nigra* and *Cedrus* are recommended. For the treeless areas created between the natural steppes and the coastal forests, planting of shelterbelts to combat drought and to improve the microclimate is recommended. Species suggested include *Quercus* spp., *P. nigra*, *P. sylvestris*, *Acacia*, *Gleditsia*, *Ulmus*, *Juniperus* and *Ailanthus*. *From author's summary.*

3344. Reflorestamento da região siderúrgica do centro do país. [**Reforestation of the steel region of central Brazil.**] *An. bras. Econ. flor., Inst. nac. Pinho* 4 (4), 1951 (247–61). [Port.e.]

Presents the findings of a committee set up in 1950 to study the problem of reforestation in the steel-producing region of Minas Gerais. In 1950 timber consumption of the steel works in this region amounted to 2,326,358 cu.m. of wood (fuelwood and charcoal). On the basis of growth in the Eucalypt plantations of the Cia. Paulista de Estradas de Ferro (an average yield/ha. of 250 cu.m. from 7- to 8-year-old plantations), 9,300 ha. (23¼ million trees) must be planted per annum to ensure an adequate supply to the steel works.

235. *Underplanting, Advance Planting etc. Nurses and Formation of Mixtures. Interplanting of Inferior Growth*

See Nos. 3185, 3238–40, 3469.

236. *Care of Regeneration or Plantations in the Initial Stages of Establishment (including Regeneration Surveys)*

See also No. 2971.

3345. Becavin, H. Le recépage mécanique des accrus. [**Mechanical cutting of regrowth.**] *Rev. for. franç.* 5 (1), 1953 (13–4 + 2 photos). [F.]

Describes a demonstration of the 'Attila', a brush-cutting machine [Ets. Creusy-Veron, 12 bis Grande Rue, Le Plessis-Bouchard (S. et O.)]. It consists of a low chassis mounted on two small driving wheels. An 8-h.p., 2-stroke engine drives the wheels and also turns a horizontal disk at ground level, armed with cutting knives. The total weight is 420 kg., rate of movement 2–3 km./hr., width of cut. 0·6 or 0·8 m., and consumption of petrol 1·5 litres/hr. The machine is driven by one man, holding two handles like those of a small plough. It cuts grass and herbage close to the ground and during the demonstration easily cut Blackthorn bushes up to 1 m. high with stems of 5–6 cm. diameter. The cost of the machine with cutting width of 0·6 m. is Fr.310,000; and with 0·8 m. Fr.520,000.

3346. [**Effect of hoeing in plantations of *Melia azadirachta*.**] *Rep. For. Adm. Nigeria 1950/51*, 1952 (22–3).

A feature of experimental plantations of Neem (*Melia azadirachta*) was the striking effect of freeing the young plants from grass. Strips that had been hoed to rid them of grass, with very little breaking of the soil, showed a spectacular difference in health and survival. The result appears to be due almost entirely to the eradication of the grass and not to disturbance of the soil, for cultivation round plants had no better effect than light surface hoeing. Where 2 + 0 nursery stock was used, mortality in

hoed strips was ca. 20% compared with over 75% in unhoed areas; with 1 + 0 stock the figures were 48% and 90% respectively.

3347. SETH, S. K. **Sampling and assessment of natural regeneration.** *Indian For.* 79 (5), 1953 (274–87). 3 refs.

Points out the inadequacy of sampling methods at present used in regeneration surveys in U.P., and discusses in detail various methods of systematic sampling, the lay-out of sampling units, and the calculation of error, all with particular reference to gregarious species such as *Shorea robusta.*

237. *Amelioration of Forest Sites*

See also Nos. 2994–5, 3302.

3348. LARSEN, S. En ny planteplov med interessante muligheder (Tolneploven). [**A new planting plough with interesting possibilities (the Tolne plough).**] *Hedeselsk. Tidsskr.* 74 (3), 1953 (41–4). [Dan.] C.G.B.

Describes with illustrations the Tolne plough, manufactured by Plovfabrikken 'Bovlund', Branderup J, Denmark, and intended for use between the trees of existing stands. A disc coulter set in a groove in the tip of the double-mouldboard plough passes over obstacles that it cannot cut through, lifting the ploughshare with it. There is a deep-cultivating knife, which will loosen the soil in the bottom of the furrow to a depth of 25–30 cm.; it moves freely in a vertical direction so that it, too, lifts over obstacles it cannot cut through. The plough is used attached to a small caterpillar tractor, the Bristol 20, and one operator in addition to the tractor driver is needed. On average soils it will plough ca. 6000 linear m./day. The furrow is 40 cm. broad at the bottom. Damage to the small tree roots lying near the surface is considered relatively unimportant.

3349. **Fertilizing Longleaf seedlings with urea nitrogen in south Mississippi.** *Rep. Sth. For. Exp. Sta. 1952* [1953?] (42).

Natural Longleaf Pine seedlings from the 1948 seed crop, growing on a dry sandy site, were sprayed 4 times in 1951 and 5 times in 1952 with urea N (Nu Green) and Bordeaux mixture alone or in combination. Urea N was applied at a rate of 25 lb.N/acre per application. At the end of two growing seasons untreated seedlings and those sprayed with urea N alone had both grown an average of 0·06 in. in root-collar diameter, and those sprayed with Bordeaux mixture with or without urea N, 0·12 in. Spraying with Bordeaux mixture kept brown-spot defoliation down to 4% in Dec. 1952 as against 54% for unsprayed seedlings.

3350. WITTICH, W. [Translated by THOMSON, T.] **Significance and basic principles of lime manuring in the forest.** *Coedwigwr* 1 (4), 1952 (11–8). [E.]

3351. GOOR, C. P. VAN. Groeiremmingen bij de Japanse lariks (*Larix leptolepis*) ten gevolge van kalkbemestingen. [**Reduction in growth of *L. leptolepis* caused by liming.**] *Ned. Boschb.-Tijdschr.* 25 (3), 1953 (57–68). 5 refs. [Du.e.] (*Korte Meded. Bosbouwproefsta. T.N.O., Wageningen* No. 15.)

Pot experiments and field experiments are discussed and results are given in graphs and tables with English legends. In the pot experiments, as liming gives the effect of an indirect N fertilization, different quantities of $NH_4NO_3 + H_3PO_4$ were added to 3 soils, (1) poor in both N and P, (2) poor in P and rich in N, and (3) rich in both. Tabulated results show dry weight of stem and needles, and of roots, and length of stem; the dry weight of stem and needles is shown plotted against the quantities of N and P added to the soil. On (1), growth was increased by N in small quantities and in combination with P, but greater quantities of N reduced growth. On (2), a normal forest soil, all but the smallest applications of N reduced growth. On (3), growth increased slightly with increasingly heavy applications of N. Field liming experiments with Larch up to 20 years old gave similar results, showing a reduction in growth with increasingly heavy applications of lime. It is concluded that soils rich in humus are less suitable for *L. leptolepis* and should certainly not be limed, that poor heathland may be treated with not more than 100 kg. marl/ha. in combination with phosphate, and that phosphate almost always increases growth.

3352. JUNACK. Erste Ergebnisse von Düngungsversuchen im Gräfl. Bernstoffschen F A Gartow. [**Preliminary results of fertilizer trials in the Bernstoff forest district, Gartow.**] *Forst u. Holz* 8 (10; 11), 1953 (135–7; 151–3). 2 refs. [G.g.]

Presents the results of 3 years' experiments, ending 1952. On the sites in question (strongly acid, sandy soils, in a transitional stage between mineral and peat soil, with a high water-table and a ground flora mainly composed of *Molinia caerulea* and *Erica tetralix*) phosphates had by far the best effects. Surface applications of Rhenania phosphate $[Ca_2Na_2(PO_4)_2 + 2CaSiO_3]$ at 400–600 kg./ha. increased within 6 months: (1) the diameter of 1- to 3-year-old Poplars by 40–60%, (2) the height of 5- to 7-year-old Spruce by 10–60%, (3) the height of 3- to 5-year-old Alder by 100%, and (4) the height of 4-year-old Pine by 30–33%. The same applications improved the ground flora and encouraged Birch regeneration. They also increased the growth of perennial lupin.

3353. [**Phosphate application to *Pinus taeda*.**] *Rep. Dir. For. Qd. 1951/52*, 1952 (7–8).

Measurements of merchantable volume to 3 in. diam. u.b. in 1951 on *P. taeda* planted in 1931 in soil with total P_2O_5 in the surface 4 in. 55 p.p.m., and given applications of superphosphate in 1939, were as follows: no addition (total P_2O_5 55 p.p.m.) 1229 cu.ft.; 190 lb. superphosphate/acre (total P_2O_5 90 p.p.m.) 1923 cu. ft.; 383 lb./acre (125 p.p.m.) 2404 cu. ft.; 818 lb./acre (205 p.p.m.) 3398 cu. ft.; and 1580 lb./acre (345 p.p.m.) 3425 cu. ft. [Cf. *For. Abstr.* 12 (No. 2627).]

3354. BEARD, J. S. **Fertiliser experiments on Black Wattle.** *S. Afr. J. Sci.* 49 (6), 1953 (205–6). A.P.B.

Dressings of 19·1% superphosphate or of a mixture of super and raw phosphate applied in July to plantations re-established by strip burning the previous April, produced by the following April

growth results superior to those of control plots. No difference between the two treatments themselves was noticeable. Applications were made at the rate of 200 lb./acre. A treatment with the mixture at 333 lb./acre was also given but produced no better results than the lighter dressing.

238. *Timber Plantation Crops requiring Special Treatment*

See Nos. 4049–50.

24. TENDING OF STANDS AND TREES

3355. OPPLIGER, F. Zwanzig Jahre Erfahrung mit dem Erziehungsbetrieb nach Schädelin. **[Twenty years' experience of treating forests with Schädelin's system of qualitative selection.]** *Schweiz. Z. Forstw.* 104 (3), 1953 (84–98). [G.f.]

Reports on experience in Beechwoods on the lower slopes of the Alps. The shortness of the period between snow-melt and leaf flush, and the scarcity of labour make it impossible to carry out all the prescribed operations fully. It is necessary in the first place to treat extensive areas by favouring only the incontestably superior stems. Pole-stage thinning is combined with a belated cleaning. Even with these disadvantages the Beech stands have reacted to thinning more favourably than was expected by the most optimistic forecasts.

241. *Cleanings*

See also No. 3427.

3356. BAUER, F. Die Läuterung der Roteiche. **[Cleaning of *Quercus borealis*.]** *Forst u. Holz* 8 (6), 1953 (73–4). [G.]

The following basic principles should be followed: elimination of undesirable individuals to begin earlier than with other deciduous species; trees with double leaders in particular to be eliminated early; in order to obtain many-storeyed forest, cleanings to be made at least every 3 years along with frequent felling in the upper storey, passing imperceptibly into crown thinning.

242. *Thinnings*

See also Nos. 3251, 3414, 3647, 3803, 3806.

3357. EKLUND, B. Fortsatta studier över ett gallringsförsök i stavagranskog. **[Further studies on a thinning experiment in Spruce 'pole thicket'.]** *Medd. SkogsforsknInst., Stockh.* 41 (10), 1952. pp. 66. 42 refs. [Sw.sw.e.]

Five permanent sample plots were laid out in 1923 in a 'pole thicket', i.e. crowded regeneration held in long-continued check by its own density, ca. 120 years old. Series (I) (3 plots) was in unthinned forest and (II) (2 plots) in an area thinned in 1942. In (I) the control plot had 27,081 trees/ha. in 1923, while the other two were thinned to 2507 and 1538 trees/ha., corresponding to a reduction respectively of 91% and 95% by number of trees and 72% and 83% by basal area. The volume production over the 27 growing periods between thinning and measurement in 1949 was roughly the same for all three plots (67·9, 65·6 and 69·1 cu.m./ha. respectively) but the corresponding figures for timber and pulpwood of not less than 3 in. top diam. u.b., and 10 ft. length were 5·2, 32·9 and 53·6 cu.m./ha. Series II shows that the effect of thinning is greater when the first thinning is carried out earlier. Graphs showing the trends of annual-ring breadth are adjusted to eliminate variation in climatic conditions for the different years. The view that improvements in growth after thinning are due rather to reduced root competition and to the increased decayed vegetable matter supplied from the mycorrhizae and fine-root systems of the felled trees than to improved ground temperature conditions, is discussed.

3358. MACARTHUR, R. S. **Early thinning treatment and growth development of *Pinus radiata* D. Don. established at excessively high initial density.** *N.Z. J. For.* 6 (4), 1952 [1953] (333–8). 1 ref.

In order to obtain some light on the problem of how to treat the very dense natural regeneration of *P. radiata* now being obtained in New Zealand [cf. *For. Abstr.* 13 (No. 2101)], a study was made of two old abandoned nursery beds (20–25 years old) part of which had been thinned at 3–4 years old. The effect of a very early thinning in reducing the proportion of stems in the 0- to 6-in. class and increasing the proportion in the merchantable 7- to 12-in. class was very marked. The good form of crop trees and small size of branches were favourable characteristics of these over-dense stands. The early assertion of dominance in these stands was very marked, and it was found that radial growth of dominant trees had been suppressed much less than might have been expected.

3359. ASSMANN, E. Bestockungsdichte und Holzerzeugung. **[Stand density and yield of timber.]** *Forstwiss. Cbl.* 72 (3/4), 1953 (69–101). 20 refs. [G.]

Discusses this theme with particular reference to the determination of the 'critical' basal area [cf. *For. Abstr.* 13 (No. 2994)] and stressing the importance and significance of frequency of thinning as opposed to grades of thinning.

3360. MITCHELL, H. C. **The D-plus principle of forest stand structures and its application to plantation spacing and the thinning of Southern Pine.** In *Management of Young Even-Aged Stands of Southern Pine*, Louisiana Forestry Commission, Baton Rouge. [1953?] (93–8 + 2 gphs.). 5 refs.

Discusses the theory and application of individual tree-space requirement based on $(D + x)^2$ sq. ft. as a guide to spacing and thinning, where D is d.b.h. in inches and x is a constant for the species. Curves for this and allied formulae are plotted over normal stand data curves (no. of trees/average d.b.h.) for *P. taeda*.

3361. TYLER, J. S. **Marking practice in even-aged management.** In *Management of Young Even-Aged Stands of Southern Pine*, Louisiana Forestry Commission, Baton Rouge. [1953?] (31–5). 8 refs.

Discusses various systems of expressing stand density as a guide for thinning and recommends a rule-of-thumb spacing calculated from d.b.h., for stands where accurate b.a. data are not available. Describes equipment used for thinning overstocked stagnated stands of Pine with diameters of

4 in. and less. It consists of a large steel drum filled with water to add weight and mounted with grader blades or old veneer knives. It is pulled by a D-4 size tractor protected in front by a bumper and brush guard. The tractor knocks down the trees and the chopping machine cuts them into 18-in. lengths. Swathes about 8 ft. wide are cleared and as thin a line of trees as possible is left between. Costs in Central Mississippi in 1951 averaged $2·25/acre.

3362. Bond, W. E. **Financial maturity—a guide in thinning.** In *Management of Young Even-Aged Stands of Southern Pine*, Louisiana Forestry Commission, Baton Rouge. [1953?] (83–7).

Discusses the conception of financial maturity of individual trees in selecting trees for thinning and gives hypothetical examples of its use in pulpwood and sawtimber stands.

3363. Crow, A. B. **Thinning methods of planted Slash Pine.** In *Management of Young Even-Aged Stands of Southern Pine*, Louisiana Forestry Commission, Baton Rouge. [1953?] (67–81).

The results of a thinning study using heavy crown, light crown, moderate low, and a selection method, are given in graphs showing trees/acre, b.a., d.b.h., height, crown % of total height, cordwood production, periodic annual increment, mortality and sawlogs/acre before and immediately after thinning at 13–14 years, and 5 and 10 years later.

3364. Livingston, K. W. **The effect of early thinning on the growth and yield of young Southern Pine plantations.** In *Management of Young Even-Aged Stands of Southern Pine*, Louisiana Forestry Commission, Baton Rouge. [1953?] (43–52).

Results of thinnings at 12 and 19 years of plantations of Slash and Loblolly Pine established in 1932 by the Alabama Polytechnic Institute at 6 × 6 and 4 × 4 ft. spacings are given in diagrams and tables showing b.a./acre, average diam. and ht., pulpwood yields/acre and sawtimber/acre left standing at 19 years.

3365. Minckler, L. S., and Dietschman, G. H. **Growth of thinned and unthinned Loblolly Pine in southern Illinois.** *Sta. Note Cent. St. For. Exp. Sta.* No. 73, 1953. pp. 2.

Gives tables showing basal area, volume and growth, and average crown size of dominant and co-dominant trees in thinned and control plots, 4 years after thinning a 13-year-old Loblolly Pine plantation. Basal area and volume growth over 4 years were about equal for thinned and unthinned plots, and trees on thinned plots have well-developed crowns. Diameter growth on unthinned plots is decreasing rapidly. During the 4 years, mortality on unthinned plots was 2 sq. ft. and on thinned plots 1 sq. ft. b.a./acre/year.

3366. Cummings, W. H. **Post yield, production costs and growth response from first thinning of Loblolly and Shortleaf Pine plantations.** In *Management of Young Even-Aged Stands of Southern Pine*, Louisiana Forestry Commission, Baton Rouge [1953?] (99–102). [Tennessee Valley Authority, Norris, Tennessee.]

3367. Boggess, W. R., and McMillan, F. W. **First thinning yields from a 15-year-old Shortleaf Pine plantation in southern Illinois.** *For. Note Ill. agric. Exp. Sta.* No. 36, 1953. pp. 2. 2 refs.

3368. Boggess, W. R., and McMillan, F. W. **Growth and second thinning yields in a 16-year-old Shortleaf Pine plantation in southern Illinois.** *For. Note Ill. agric. Exp. Sta.* No. 35, 1953. pp. 4.

Cf. *For. Abstr.* 12 (No. 822).

3369. Bramble, W. C., and Byrnes, W. R. **Early thinning of Virginia Pine.** *Res. Pap. Pa. St. For. Sch.* No. 19, 1953. pp. 3 + 3 photos.

3370. Stiell, W. M. **Thinning and growth in a Red Pine plantation.** *Silv. Leafl. For. Br. Can.* No. 75, 1953. pp. 5.

3371. Geelhand, C. Une méthode d'éclaircie pour le pin de Corse. **[A method of thinning Corsican Pine.]** *Bull. Soc. for. Belg.* 60 (5), 1953 (247–54). [F.]

There is little use for Corsican Pine between the stage (13–15 years) at which it provides stakes for agricultural and horticultural use, and that at which it yields sawtimber. The author discusses the application of Schaedelin's thinning methods in order to shorten the period between these two stages. He gives a yield table for the species, on good and bad soils, up to 60 years of age.

3372. Joergensen, C. **A commercial thinning experiment in Douglas Fir.** *Res. Notes B.C. For. Serv.* No. 22, 1952. pp. 22. 5 refs.

Presents data, with particular reference to financial aspects, that have become available after completing the first intermediate cutting in a 50-year-old Douglas Fir stand at Cowichan Lake Forest Experiment Station.

3373. Mathauda, G. S. **A study into the thinning intensities for plantation Sal (*Shorea robusta*).** *Indian For.* 79 (3), 1953 (152–8). 2 refs.

3374. Thomson, C. C. **More and better material from coppice stands of Red Maple.** *Silv. Leafl. For. Br. Can.* No. 74, 1952. pp. 2.

An experimental thinning of *Acer rubrum* coppice regrowth (reducing each clump to one stem), carried out in 1940, has given good results, and such treatment would probably be economically justified, at least on good sites.

3375. Groome, J. G. **Thinning by poisoning.** *N.Z. J. For.* 6 (4), 1952 [1953] (317–20). 4 refs.

An experiment was made of poisoning trees in order to thin a stagnant 23-year-old plantation of *Pinus contorta* var. *latifolia* which carried 590 live trees to the acre. Thinning by normal means was difficult and costly. The methods tested were: (1) girdling, (2) Na_2HAsO_3 paste on exposed surfaces, (3) 2,4-D solution in frill cuts, (4) 2,4-D/2,4,5-T solution with oil carrier in frill cuts, (5) Ammate crystals in notch cuts, and (6) Ammate solution in frill cuts. Trees given treatment (1) were still vigorous 18 months later; (3), (4) and (6) gave negative results; (5) was very satisfactory but Ammate crystals are too expensive for use in New Zealand;

(2) gave good results, and the methods of application and necessary precautions are described in detail.

243. *Opening of the Canopy (Increment, Overhead Release and Improvement Fellings)*

See also No. 3375.

3376. HAWLEY, N. R. **Merchantable height greater after improvement cut in pilot-plant management test.** *Res. Note Stheast. For. Exp. Sta.* No. 33, 1953. pp. 2.

An improvement felling removing only 18% (4 stems/acre) from young Longleaf/Slash Pine sawtimber stands was shown by successive inventories on 1471 acres to increase average merchantable height in the larger diameter classes of reserved trees by up to 2½ ft., or 16% of one standard 16-ft. log, and to increase average bd. ft. volumes by about 10%. Results are shown in graphs.

3377. MCCULLEY, R. D. **Estimated growing space liberated by the removal of residual hardwoods.** *Res. Note Stheast. For. Exp. Sta.* No. 31, 1953. pp. 2. 2 refs.

A graph is given showing the relationship between basal area and % crown cover of hardwoods. Data for calculating labour requirements for girdling and poisoning are also given.

3378. **[Poisoning trees.]** *Rep. For. Dep. Sarawak 1951*, 1953 (14).

A few trees [species not stated] were treated by frill-girdling and application of a slightly damp mixture of $CaCl_2$ (2 parts), $CuSO_4$ (1 part) and soil (2 parts). Seven months after treatment, 64% of the trees were dead and the remainder very sickly. The method is, however, expensive, the cost of poison alone being 36 cents/tree.

3379. BARNARD, R. C. **Tree killing with STCA, (sodium trichloroacetate).** *Malay. Forester* 16 (2), 1953 (110–1).

A solution of 1 lb. STCA/gal. water was applied in frill girdles to 156 trees belonging to 31 species. After 6 months, only 30 trees were dead, of which 13 were *Arthrophyllum diversifolium* and 7 *Glochidion* spp. Several *Castanopsis* spp., which are usually easily killed by ring-barking, were unaffected.

3380. **[Removing undesirable hardwoods.]** *Rep. Sth. For. Exp. Sta. 1952* [1953] (28–38).

Discusses experiments in N. Alabama, N. and S. Arkansas, the Mississippi delta, W. Florida, E. Texas and N. Mississippi, on removing hardwoods by girdling or poisoning, and makes recommendations on treatment for common conditions (illustrated by photographs) where hardwoods are to be removed in the West Gulf Pine/hardwood areas.

3381. HAWKES, C. **Planes release tree plantation.** *J. For.* 51 (5), 1953 (345–8).

Describes successful operations in Oregon for the release of 10-year-old conifer plantations from Red Alder by spraying from the air with 2,4-D at the rate/acre of 2 lb. acid equivalent mixed with 8 gal. water and 2 oz. sticker-spreader. Cost of spraying 1000 acres was $5·15/acre. Alder was killed, Willow discouraged, and little damage done to other trees or shrubs.

3382. GRANO, C. X. **Chemical control of weed hardwoods.** *Sth. Lumberm.* 186 (2332), 1953 (46–7).

Applied in frills in spring, 1% water emulsions of 2,4,5-T alone or mixed with 2,4-D killed crowns of Southern Red Oaks [*Quercus falcata*] and prevented sprouting. There was little or no difference between results from 2% and 1% emulsions. Half-and-half mixtures of the chemicals were cheaper than 2,4,5-T alone, without much loss of efficiency. The water emulsions did not effectively inhibit coppicing of stumps of felled trees less than 2½ in. d.b.h., but the oil solution of pure 2,4,5-T prevented sprouting on over 75% of the small stumps. Felling larger trees and treating the stumps with oil solutions of either chemical was effective but expensive. Basal sprays of oil solutions were not very effective.

3383. LITTLE, S., and SOMES, H. A. **Poisoning hardwoods in southern New Jersey.** *Ntheast. Res. Note Ntheast. For. Exp. Sta.* No. 16, 1952. pp. 4.

For swamp sites, treatment of standing trees with NH_4 sulphamate was promising and more extensive tests are warranted. For upland sites most promising was the use of NH_4 sulphamate crystals on the edge of freshly cut stumps. Other effective treatments (e.g. spraying with a 2,4-D/2,4,5-T combination) were more expensive. Some figures for costs are given.

3384. MCCLAY, T. C. **Estimating time requirements for tree poisoning with Ammate.** *Res. Note Stheast. For. Exp. Sta.* No. 27, 1953. pp. 2.

A regression analysis of time data from various hardwood control operations in 1950–1 showed that the number of treated trees/acre and the sum of the d.b.h. in inches of the treated trees are significantly correlated with man-hours of labour/acre. A formula for estimating the time to do a hardwood control job with a crew of 3 using Ammate in notches was derived, where man-hours/acre = 0·009 (sum of diameters of treated stems/acre) − 0·005 (number of stems treated/acre).

245. *Tending of Trees, Pruning etc.*

See also Nos. 3188, 3251, 3265, 3281, 3553.

3385. MAYER-WEGELIN, H. Das Aufästen der Waldbäume: Grundsätze und Regeln. **[The pruning of forest trees: principles and rules.]** Verlag M. & H. Schaper, Hannover. 3rd ed. (rev.) 1952. pp. 92. 125 refs. [G.] Price *DM*.7·20.

A practical manual, the 2nd edition of which was published in 1938, in two parts: I—Principles, covering *inter alia:* bud pruning; green vs. dry pruning; effects of pruning on stem form, increment and timber value; occlusion, injuries and their prevention; height and season of pruning; selection of stands and trees to be pruned; technique and equipment; selection and training of workers; costs and bookkeeping. II—Rules for pruning Norway Spruce, Scots Pine, Silver Fir, Larch, Douglas Fir, Beech, Oak, Poplars and Birch.

3386. BICKERSTAFF, A. **Debudding Red Pine—ten-year results.** *Silv. Leafl. For. Br. Can.* No. 73, 1952. pp. 4. 1 ref.

Results of the first 5 years of this experiment have already been published [cf. *For. Abstr.* 8 (No. 276)].

It now appears that it is possible to obtain a completely knot-free log length of Red Pine by disbudding in a period of 10 years. The treated trees were of better form, but smaller diameter, than controls. It is recommended that disbudding be attempted only in fast-growing plantations on a good site. The average height of the plantations should be 3–5 ft. and spacing 8 × 8 to 9 × 9 ft., when treatment begins.

3387. McClay, T. A. **The relation of growth to severity and season of pruning open-grown Loblolly Pine.** *J. For.* 51 (4), 1953 (287–8).

In an old-field stand pruned at 10–15 years, average annual diameter growth in the 6 years after pruning was significantly lower for trees pruned to $\frac{2}{3}$ total height in summer and to $\frac{1}{2}$ total height in winter than for unpruned controls, and lower, but not significantly so, for trees pruned to $\frac{1}{2}$ height in summer. There was a slight but not significant difference in height growth in favour of unpruned trees.

3388. Volkert, E. Untersuchungen über das Verhalten von Astwunden nach Grünastung und natürlichem Astabfall bei Rotbuche. [**The behaviour of branch wounds after green pruning and natural branch fall in *Fagus sylvatica*.**] *Forstwiss. Cbl.* 72 (3/4), 1953 (110–24). 10 refs. [G.g.] [Institut für Forstbenutzung der Universität Göttingen.]

The progress of discoloration was studied in occluded wounds made by artificial pruning of Beech. The discoloration appears to be connected with drying out of the wood, since the bigger the wound and the greater the area exposed to drying, the deeper is the penetration of the discoloration. Discoloration never affects tissue laid down after occlusion, and practically ceases to penetrate into the tree a few years after the wound has healed. Fungi entering by way of such wounds were still alive 9 years after occlusion, but their penetration slows down 5–9 years after the wound has healed, and finally practically stops. No fungi were found in tissue laid down after the wound was made. These observations apply only to branches up to 50 mm. in diameter and to trees of medium age. In Beech ca. 130 years old, fungi were still found in wounds caused by natural pruning 80–100 years earlier. Examination of part of the stem of a 126-year-old Beech lacking scars of any unusual character, showed fungi to be present in the region of all occluded pruning wounds, as well as at a distance from them, and in many parts of the slightly discoloured heartwood. There was no direct connexion between the discoloured heartwood and the outside atmosphere through an unhealed pruning wound.

25. TREATMENT OF DEFECTIVE, DERELICT OR VERY OPEN STANDS

3389. James, N. D. G. **Restoration of unproductive woodlands.** *Quart. J. For.* 47 (2), 1953 (116–20 + 1 photo).

Two types of woodland that present specially difficult problems in Great Britain are unproductive coppice and derelict, devastated woodland. The various methods of treating the former are described and discussed; while for both types mechanical clearing is advocated.

3390. Hatiar. O stave devastovaných lesov. [**The condition of the devastated forests.**] *Pol'ana* 8 (5), 1952 (92–5). [Slovak.]

Analyses the present condition of forests in Slovakia which have been devastated by over-felling.

26. FORESTRY IN AGRICULTURAL AND PASTORAL AREAS (INCLUDING SHELTERBELTS AND THEIR TREATMENT)

265. *Strips or Lines at Road, Rail and Canal Sides etc.; Hedgerow Trees*

See No. 3010.

266. *Shelterbelts, Windbreaks*

See also Nos. 3150, 3153, 3254, 3343.

3391. Woodruff, N. P., and Zingg, A. W. **Wind tunnel studies of shelterbelt models.** *J. For.* 51 (3), 1953 (173–8). 5 refs.

Wind-tunnel studies were conducted to obtain information on the following two phases of the shelterbelt problem: (1) the effect of the number of rows within a shelterbelt, and (2) the general design and orientation of shelterbelts with respect to the direction of the prevailing winds. Models of a 5-row, 7-row, and two different designs and two orientations of a 10-row shelterbelt were used in a wind tunnel to obtain this information. The influence of the shelterbelt both at the ground surface and at elevations extending to three times the height of the tallest trees is given. Pitot-tube measurements of horizontal velocity, velocity profile maps and shear or erosion patterns in sand are employed to describe the flow about the shelterbelts. The different shelterbelts are ranked according to their effectiveness in reducing the velocity at the ground surface and at elevations above the surface. A 10-row shelterbelt of conventional design was found to be the most effective at both levels. The alternative designs of 10-row belts were less effective or were variable in their effectiveness, with some designs showing relatively more effectiveness at higher elevations than at the surface. The 5- and 7-row shelterbelts were found to offer nearly as much protection as the 10-row designs. *From authors' summary.*

3392. Evans, J. D. D. **Shelterbelts for hill farms.** *Quart. J. For.* 47 (2), 1953 (101–6).

Discusses briefly the reasons for the fewness of shelterbelts in Great Britain, and the errors in design of those that have been established. The progress and treatment of an imaginary belt during the whole period of its growth and development is considered. The need for long-term research is emphasized.

3393. Lhota, O., and Mařan, B. Směrnice pro zalesňování a zakládání ochranných lesních pásů. [**Instructions for afforestation and establishment of forest shelterbelts.**] *Za social. Zeměd.* 2 (11), 1952 (1266–87). [Cz.cz.] C.G.B.

Includes sections on: planning of shelterbelts (siting and spacing); soil preparation; season and

method of formation; tending; selection of tree and shrub species.

3394. Tymko, M. M. Greckiĭ oreh v polezaščitnyh nasaždenijah i orehovyh roščah. [***Juglans regia* in shelterbelt plantations and nut groves [in Moldavia].**] *Dokl. vsesojuz. Akad. sel.-hoz. Nauk Lenina* 17 (6), 1952 (19–22). [Russ.] A.P.B.

Urges the value of *J. regia* as a source of high-quality timber and nut crops. Notes, in connexion with its use for plantations in dry areas, that direct sowings have superior drought resistance, since a strong deep root system develops without interruption. Nursery plants have done well at first in the moist spring, but perished when the hot weather came. In early Sept. of their first year, seedlings in a direct-sown shelterbelt on the Michurin Collective Farm had taproots 1–1·5 m. or more long. One-year seedlings are 5–15 cm., and two-year seedlings 21–53 cm. tall. At 4 years of age, heights of 2 m. and more may be attained.

The value of the nuts as a source of oil is stressed, and a [total?] yield of 25,000 nuts—equivalent to ca. 40 kg. of oil—is quoted for a 35-year-old tree on another collective farm. Ten adult trees should yield as much oil as 1 ha. of sunflower.

Some suggestions are made on site preparation and direct sowings of Walnut in combination with agricultural crops, on the same general lines as Lysenko's nest method for Oak.

3395. Stauffer, D. E. **Tree planting in the shelterbelt area [of the Great Plains]: what we have learned in the fifteen years of this project.** *For. Fmr.* 12 (3), 1952 (12–3, 22).

A summary in very general terms.

3396. Burrell, J. P., and Owtram, I. H. **Planting shelter for pigs.** *N.Z. J. Agric.* 85 (6), 1952 (475 . . . 8). A.P.B.

Recommends species and planting distances suitable in New Zealand for (1) main shelterbelts of tall-growing trees to act as a windbreak for the piggery and paddocks, (2) low shelterbelts round paddocks, and (3) trees planted for shade.

268. *Pastured Forests. Grazing on Forest and Open Ranges. Forage Plants etc.*

See also No. 3007.

3397. **Grazing and forest economy.** *FAO For. & For. Prod. Stud.* No. 4, 1953. pp. 161. Refs. as footnotes.

Consists of two parts—(1) general relations between grazing and forest (includes chapters on: grazing in the forest; the relation between the forest and grazing outside the forest; the organization of natural grazing grounds; grazing management; pasture improvement on the natural grazing grounds); and (2) regional situations: (*a*) temperate, (*b*) tropical, and (*c*) arid regions.

3398. Domes, N. Untersuchungen über Waldweide: V. Entwurf einer provisorischen Waldweideertragstafel. [**Investigations on forest pasturage: V. Draft of a provisional forest pasture yield table.**] *Zbl. ges. Forst- u. Holzw.* 71 (4), 1952 (341–54). 16 refs. [G.]

Develops two tables giving annual pasture yields in the eastern Alps under Norway Spruce, Beech and Larch: (1) for regular high forest only, in 4 broad age classes, against forest site quality and density of stocking (trees/ha.); (2) for regular and selection forest separately, as the average for a whole forest rotation, tabulated against site quality and density of stocking. As no suitable local figures existed for the ratio of forest to open pasture yields, provisional use was made of figures calculated by Danckelmann for central German forest pastures.

3399. Defensa de montes contra incendios y pastoreo. [**Protection of the forests against fire and grazing.**] *Agric. venez.* 17 (156), 1952 (6–10). [Span.] A.P.B.

Reviews methods of controlling forest fires and damage to forests by livestock, with particular reference to Venezuelan conditions. Goats should be entirely excluded from the forests. Small stock should not be allowed in coppice less than 10 years old, nor larger stock in coppice under 15 years old. In high forest, no stock should be allowed where regeneration is less than 20 years old and in normally stocked forest only 1 head of sheep per ha. In open forest an incidence of 1·5 or 2 units of stock per ha. is permissible, on the basis that 1 bull, 1 cow, 3 yearling calves, 1·5 two-year-old calves, and 6 sheep require roughly equivalent grazing.

28. Husbandry of Forest Products other than Wood

See also section 89.

282. *Bark Crops*

See also Nos. 3354, 3973–4, 3977.

3400. Métro, P., Vidal, P., and Sauvage, C. Rapport de mission au Portugal. [**Report on a mission to Portugal.**] *Ann. Rech. for. Maroc 1951*, 1952 (59–72). [F.]

Report on a tour to study Cork Oak.

283. *Fruit and Seed Crops*

See also Nos. 3394, 4049.

3401. Megha, G. Il castagno in provincia di Cosenza. [**The Chestnut in the province of Cosenza.**] *Ital. for. mont.* 8 (2), 1953 (87–101 + 1 map + 4 photos). 9 refs. [It.it.f.]

Describes the silvicultural methods, choice of varieties etc. used, in growing *C. sativa* for nuts in Calabria, and gives a detailed account of the assortments obtained from the timber and coppice growth.

284. *Crops Tapped for Exudations*

3402. Čokl, M. Pomen in problemi smolarjenja. [**Significance and problems of resin-tapping.**] *Izv. gozd. Inst. Sloven.* No. 1, 1947/49 (1950), (231–51). 5 refs. [Sloven.russ.f.]

Presents the results of experimental tapping conducted in a pure *Pinus sylvestris* stand ca. 60 years old, at Ravne Polje in the Dravske Polje in 1946. The area is at 230 m. alt., 130 km. from the sea, flat, with a deep sandy, porous, soil, overgrown with moss and *Cytisus scoparius*. Average rainfall is 889·2 mm., of which 617·5 mm. falls during the 6 months' growing season (mid-April to mid-Oct.). Temperature data were lost in the war. The stand density is 0·7–0·8; average diameter and height of the tapped stems, which are rarely straight, 28–31

cm. and 22–23 m., respectively. Eight tapping regimes were tried: (1) narrow (4–5 mm.) freshenings alternating with medium (8–10 mm.), every 3, 4, or 5 days; (2) narrow freshenings alternating with broad (12–15 mm.), every 3, 4, or 5 days, and (3) narrow freshenings, every 3 and 4 days, or every 3 and 5 days, alternately. The depth of cut was 5–7 mm. Each of the eight regimes was applied to 40 stems. Two faces (E. and W. sides, each tapped on a different regime) were cut per stem. The Finowtal tapping method was used, with the *Wiener Hobel* [cf. *For Abstr.* 14 (No. 2264)] (one cut for the narrow, 2 for medium and 3 for broad freshenings; all were made before noon). Resin was collected the day following every second freshening. Faces were made at b.h., and the two faces occupied ca. ¾ of the circumference. It was found that (1) narrow freshenings gave the highest yield per sq. cm. of tapped face; (2) broad freshenings gave the highest yield per cm. of circumference; (3) narrow freshenings gave more resin per sq. cm. on a 4- than on a 3- or 5-day cycle. The general conclusion is that it is more advantageous to make broad freshenings (7–9 mm.) at 5-day intervals than narrow freshenings more frequently, when short-term tapping is planned.

3403. Anderson, A. B. **Producing extractive materials from living trees.** *U.S. Patent* 2,612,000, Sept. 30, 1952. pp. 14 + 4 dgms. P.O.

The tree is cut across the grain with a thin cutting tool so as to form a closed wound reaching up to the heartwood, thus causing intense accumulation of extractives around the wound inside the stem. Stimulants may also be used.

3404. Clements, R. W. **Correct use of the spray gun.** *Naval Stores Rev.* 62 (51), 1953 (16–7).

How to apply acid correctly and in the proper amounts, when using chemical stimulation in resin tapping.

3405. Oudin, A. Activation, par projection d'acide sulfurique, de la production de gemme du pin maritime (*Pinus pinaster* Sol.). **[Stimulation of resin production in *P. pinaster* by applying H_2SO_4.]** *Comptes Rendus des Séances de la Société de Biologie et de ses Filiales, Paris* 146 (19/20), 1952 (1618–9). [F.] O.R.S.

Summarizes results to date of French experiments. Only a slight increase in yield (10–15%) is obtained when H_2SO_4 is applied to faces tapped by the Hugues method commonly used in France. Better results are obtained by American methods especially on small faces at bark depth. Yields are 25–30% above those from the Hugues method without H_2SO_4. The quality of the resin is unchanged. The use of the American method without H_2SO_4 gave yields about half of those obtained using the Hugues method without H_2SO_4. [Cf. *For. Abstr.* 13 (No. 3015).]

3406. David, R., and Blieck, W. Action du 2,4-dichlorophénoxyacétate de sodium et du 2,4-dichlorophénoxyacétate d'alkylamines sur la cicatrisation des cares chez le pin maritime. **[The action of 2,4-dichlorophenoxyacetates of sodium and of alkylamines on the healing of resin-tapping streaks on *Pinus pinaster*.]** *C.R. Acad. Sci., Paris* 236 (8), 1953 (837–9). 2 refs. [F.] O.R.S.

Wounds measuring 8 × 1·8 cm. made by a modified American 'bark-chipping' method were treated with solutions or emulsions of 2,4-D derivatives in different concentrations. Concentrations of 5 and 15 g./litre of 2,4-D alkylamines, and 0·5, 1, 4, 5, 8 and 20 g./litre of Na 2,4-D, stimulated cell proliferation, the entire surface of the wound being healed over after 1 year. Concentrations of 20, 30, 40 and 50 g./litre of 2,4-D alkylamines and 40 g./litre of Na 2,4-D, stimulated a more erratic proliferation, and only part of the surface healed over.

3407. **[Latex production by *Alstonia* spp.]** *Rep. For. Dep. Sarawak 1951*, 1953 (15).

As a preliminary experiment, several small wild trees of *Alstonia angustiloba* and *A. spathulata* were tapped for 3 successive days. There was little difference in the yield of the two species or from dry or swampy sites, but a marked increase in yield with increase in girth. Yields were poor and fell away at successive tappings. Average daily yield/tree varied from 0·38 to 1·08 fluid ounce.

3408. Pourtet, J. L'érable à sucre en France. **[The Sugar Maple in France.]** *Rev. for. franç.* 5 (6), 1953 (416–20). [F.]

Experiments were made in tapping trees of *Acer saccharum* at several arboreta in France. The sugar content of the sap was equal to that obtained in Canada, but the meteorological conditions necessary for obtaining a good flow (frosty nights and sunny days) occur too rarely in most parts of France for cultivation on a commercial scale to be practicable.

3409. Oieni, S. Il frassino de manna in Sicilia. **[The Manna Ash [*Fraxinus ornus*] in Sicily.]** *Monti e Boschi* 4 (3), 1953 (113–23). 9 refs. [It.f.e.]

Gives data on the extent of plantations, silviculture, methods of tapping, and yield of manna.

285. *Leaf Crops*

3410. Sočava, V. B., and Bokučava, M. A. Nekotorye dannye o roste čaja i kačestvo čaĭnogo lista pod pologom lesa. **[Some data on the growth of Tea and the quality of its leaf under forest canopy [in Moldavia].]** *Dokl. Akad. Nauk SSSR* 85 (5), 1952 (1169–71). [Russ.] A.P.B.

Trials of Tea as a plantation crop are in progress in Moldavia. Comparison of results—so far for 1-year seedlings only—(1) in the open and (2) on strips 5 m. wide, cut through a 40-year-old forest stand, predominantly of Hornbeam, shows that field germination % and survival and height of the seedlings were better in (2), and the quality of the leaves was satisfactory.

288. *Crops Grown for Animal Products*

3411. Gupta, V. K. **Occurrence of the yellow strain of lac insect *Laccifer lacca* Kerr. (Coccidae) in Delhi.** *Curr. Sci.* 22 (2), 1953 (49). A.P.B.

A yellow strain was observed along with red larvae on *Ficus religiosa* in Delhi during October 1951. *Butea frondosa* was inoculated with the yellow strain in the same month, and up to March 1952 the insects throve well, but suffered great mortality in April, May and June. It is thought that the occurrence of a fairly high % of the yellow strain on *F. religiosa* is related in some way to the quality of nutrients available on the host.

31. LOGGING AND TRANSPORT: GENERAL

3412. Eeckhout, L. E. L'exploitation forestière au Congo Belge. **[Forest exploitation in the Belgian Congo.]** Ministère des Colonies, Bruxelles. 1953. pp. 154 + map + 96 photos, drawings and dgms. 27 refs. [F.]

Covers logging, sawmills, seasoning and preservative treatment and includes notes on the principal species.

32. FELLING AND RELATED OPERATIONS

321. *Marking*

3413. Lekander, J. Stämpling med färgpistol. **[Marking trees with a paint gun.]** *Skogen* 40 (6), 1953 (117–8). [Sw.]

Discusses the value of colour marking and requirements for equipment (especially the need for a device to expel the liquid by other than hand pressure) and paint, and describes briefly the Swedish 'Wood-Spray' in which the paint is kept under pressure in a container carried on the back in a rucksack-type frame and has a pistol-type release. Pressure, obtained by means of an air-pump attached to the container, is shown on a dial. With 1 litre of paint, pumping for 35 sec. brings the pressure up to that best suited to the work, viz. 2 kg./sq. cm.; this pressure is maintained as long as there is any paint in the container, and one litre is sufficient for about 700 marks. The pistol controls the amount of paint released at each shot, and this amount can be adjusted. It has a range of 3–5 m. The equipment weighs 7 kg. empty and about 9 kg. with 2 litres of paint. It is shown in a photograph.

322. *Preparatory Measures*

See No. 3560.

323. *Felling and Subsequent Primary Conversion*

See also Nos. 2971, 3452.

3414. Oosting, W. Productieverhoging zonder kostenverhoging. **[Increased production without increased cost.]** *Ned. Boschb.-Tijdschr.* 25 (5), 1953 (144–6). [Du.]

Tabulates figures showing production rates for Spruce, Larch and Pine from a thinning operation, when a 1-man bow saw, a barking spud with 3 cutting edges and the Iltis axe were used [cf. *For. Abstr.* 13 (No. 3882)], and compares them with similar figures for 1947 before the new tools were introduced.

3415. McClay, T. A. **Relation of tree size to production rates when cutting Pine pulpwood with a chain saw.** *Res. Note Stheast. For. Exp. Sta.* No. 28, 1953. pp. 2.

Tables are given showing the relative production time per cord for cutting Pine pulpwood by tree size (in % of time required for 10-in. 7-bolt trees) and the man-hours/cord to fell, trim and cross-cut Pine pulpwood by tree size.

3416. Douda, V., and Jindra, J. Nové formy organisace těžebních prací. **[New forms of logging organization.]** *Práce výzkum. Úst. lesn. ČSR* No. 2, 1953 (5–42). 22 refs. [Cz.russ.g.]

Presents the results of preliminary tests on labour efficiency in tree-felling and subsequent primary conversion in the forest, using squads of 6–15 workers with petrol-engine chain-saws in Spruce and Pine stands, where the single-tree volume varied from 0·1 to 0·8 cu.m. It was found that, compared with the small squads of 2–3 workers previously used, the labour efficiency rose by 40% and the utilization of saws by 80–100%. The average weight and cost of tools were reduced by ca. 50%.

3417. Harrison-Smith, J. L. **One-man chain saws.** *N.Z. J. For.* 6 (4), 1952 [1953] (321–30).

Variations in design and construction of one-man chain saws are described in detail, and their advantages and disadvantages discussed. Methods of operation are dealt with, and advice is given on the points to be considered when buying a chain saw. *Author's summary.*

3418. Viljke, G. A. Novye èlektričeskie pily. **[New electric [chain] saws.]** *Lesn. Prom.* 11 (7), 1951 (16–9). [Russ.]

An illustrated description of the following new models constructed at the Likino machine plant: (1) model VVK, felling, one-man type, power 1·3 KW., saw-guide length 47 cm.; (2) model VRK, cross-cutting, one-man type, power and length as VVK; (3) model VVD, felling, two-man, power 2·5 KW., saw-guide length 100 cm.; (4) model VRD, cross-cutting two-man, power and length as VVD. The weight of VVK and VRK is 9·5 kg., of VVD and VRD, 12 kg. The saws are equipped with asynchronous motors of 12,000 rev./min. The tooth-chain spacing is 17·5 mm., speed 4·1 m./sec., kerf 8·6 mm. Tests show that the output is 50 sq. cm./sec. for the one-man and 70 sq. cm./sec. for the two-man types.

3419. Vil'ke [Viljke], G. A. **New electric saws.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 1786, 1952. pp. 7 + 2 photos + 4 dgms. Transl. by P. A. Gibson from *Lesn. Prom.* 11 (7), 1951 (16–9). Limited distribution.

3420. **Safety in chain saws handling.** *Timber of Canada* 13 (8), 1953 (21–4, 60).

Extracts from a pamphlet issued by the Wood Products Section, National Safety Council, Chicago, listing the particular dangers of chain saws and recommending safety precautions.

3421. Fenton, R. H. **Simple measuring device speeds pulpwood cutting.** *Ntheast. Res. Notes Ntheast For. Exp. Sta.* No. 19, 1953 (3–4).

Describes briefly a device, consisting of a car-radio antenna, which can be attached to a chain saw by a simple swivelling bracket, to eliminate separate marking.

3422. RUTHERFORD, W., JR. **Relative ease of peeling Beech, Red Maple, and Yellow Birch.** *Ntheast. Res. Notes Ntheast. For. Exp. Sta.* 19, 1953 (1–2).

The wood (pulpwood in 4-ft. bolts) was barked within 4 hours of felling. Yellow Birch barked most and Beech least readily. Yellow Birch and Red Maple were certainly as easy to bark as either Spruce or Fir.

3423. MAKKONEN, O. Kuoriluokitus hakkuutöiden palkkausta varten. **[Bark classification for the determination of logging wage scales.]** *Metsät. Aikak.* 1953 (2), (47–50). 4 refs. [Fi.e.] (*Tied., Metsäteho, Helsinki* No. 86).

Considers the effects of thickness and quality of bark on working time for Pine and Spruce. In Pine, the butt generally has fissured bark, which hampers barking, while the top has thin soft bark. The following classification is proposed: Class 1, under 25%, class 2, 25–50%, and Class 3, over 50%, of the stem length covered with fissured bark. Spruce bark is generally similar for the whole length, but is thin or soft on good, and thick and hard on poor sites. A classification is proposed based on bark thickness as a % of d.b.h. A graph and diagram [with English legends] are given showing the limits between the classes for different d.b.h., from the absolute thickness of the bark and the diam. o.b. The bark class may, if necessary, be corrected for unusually soft or hard bark. *From author's summary.*

3424. RUBIDGE, A. B. **Log splitting using explosives.** *Sudan Silva* 4 (1), 1952 (21–3).

The Sudan Forest Service has developed a 'gun' for splitting large logs for boiler fuel. The method is described.

35. RATIONALIZATION OF WORK. WORK STUDIES

See also Nos. 3377, 3384–5, 3404, 3414–24, 3441, 3451.

3425. KOOLS, J. F. Arbeidsrationalisatie in de bosbouw. **[Rationalization in forest work.]** *Ned. Boschb.-Tijdschr.* 25 (4), 1953 (88–90). [Du.]

The main points of a paper read at a meeting of the Nederlandsche Boschbouw Vereeniging in Nov. 1952, with discussion. Includes figures showing the % of labour cost in the total cost price of timber for Pine (41%), Douglas Fir (56%), Oak (23%) and Poplar (56%).

3426. SPEIDEL, G. Das Stückmassegesetz und seine Bedeutung für den internationalen Leistungsvergleich bei der Forstarbeit. **[The 'piece-number/volume law' and its significance for international comparisons of performance in forest work.]** Gesellschaft für forstliche Arbeitswissenschaft e.V., Reinbek [bei Hamburg]. 1952. pp. 40. 39 refs. [G.g.] (*Schriftenreihe des Instituts für forstliche Arbeitswissenschaft* (*Iffa*) No. 5.)

It is known that in the primary conversion of wood, T—the actual working time per unit volume of product, gives when plotted against m—the mean volume of the stems felled, a hyperbolic type of curve such that T decreases with increasing m (or with decreasing unit volume of product/m, i.e. with decreasing number of stems per unit volume of product). This has been termed the *Stückmassegesetz* ('piece-number/volume law'). By mathematical analysis of the figures given by the German tariff for woodcutters' wages (*Einheitstariff für Hauerlöhne*, 1944), which are based on averages from many individual performance studies, the author deduces a generalized equation of this law in the form $T = A + \frac{B}{m}$. This can be used for any species or assortment of wood, and for partial times (partial operations) as well as for the total time (whole operation). The time T is accordingly composed of the coefficient A, which is constant for a given species and assortment, and $\frac{B}{m}$ which varies with m. It is shown that the quotient

$$q_1 \left(= \frac{A}{A+B} \right)$$

is almost constant, regardless of species, for a given assortment, and that when $m = 1$ cu.m. solid volume, $A = T \times q_1$ and $B = T \times (1 - q_1)$. If, therefore, a suitable time tariff exists for the assortment concerned, of even a single species, q_1 is known and it is simple to calculate A and B. This affords a short cut in the construction of further tariffs, since only the mean value of T for $m = 1$ cu.m. need be known for an operation involving a particular species and assortment, the T values for other m values being calculable from the basic equation of the law. Where a working process is being studied for the first time, the coefficients can be calculated from the working times for two values of m by formulae given in the text, which are valid for both total and partial actual working times. The basis if also set forth of a graphical method of finding A and B. It is suggested that these coefficients should be accepted as a satisfactory basis for international comparisons of working performances, in the form of the index $N = A/B$, e.g. the normal performance in making barked long timber from Spruce in Germany would be expressed as $N = 81{\cdot}29/20{\cdot}32$, from which other values of interest could be deduced by solving the basic equation. It would also be a convenient expression for comparisons of the results of different working procedures or equipment in converting trees or logs of a given species to a given wood assortment.

3427. ALMBERGER, P., and NYGREN, K.-G. Några resultat av arbetsstudier i skogsvårdsarbeten. **[Some results of work studies in silvicultural work.]** *Skogen* 40 (4*), 1953 (42*–45*, 53*). [Sw.]

Discusses, and gives graphs showing, the results of studies in the State forests on: planting by different methods and 1 or 2 men; sowing by different methods, with a comparison of the relative times for sowing and planting; and cleaning, showing the most suitable tools for different tree diameters, and the effect of training on speed of work. Discusses the advantages of piece-work in improving techniques. [Cf. *For. Abstr.* 14 (No. 1237).]

37. TRANSPORT

372/377. *Land Transport*

See also No. 2971.

3428. SUMITA, Y., and NARUSE, Y. **[Construction of an experimental suspension chute in the 'Chichibu' University forest.]** *Bull. Tokyo Univ. For.* No. 39, 1951 (61–80 + 4 photos). 1 ref. [Jap.e.]

Describes and illustrates a wooden [dry] chute 169 m. long, connecting two railway terminals over very rough country in the Chichibu University Forest. The main part of the chute, crossing a deep valley, is slung on steel cables. It consists of the following sections [the first figure denotes length in m., the second, gradient in °]: 10,29; 10,19; 70,17; 9,−10 (i.e. a short 'uphill' section); 15,29; 55,15. The rim-to-rim width of the chute is 180 cm. and its inside depth 65 cm. Its construction was preceded by experiments to determine the coefficients of static and dynamic friction for logs on such a chute, and by mathematical analysis to determine its vertical profile and the maximum cable tension. The chute has worked satisfactorily, logs running down by gravity alone. Log velocities have been found to conform to theory. Experiments are being continued. The construction is illustrated by diagrams and photos.

3429. PETROVIĆ, L. Određivanje pravca trase žičare. **[Determination of the direction in which an aerial cableway should be laid out.]** *Šumarstvo* 5 (4), 1952 (310–8). [Serb.serb.f.]

Survey methods suitable for various situations and circumstances are described and illustrated.

3430. WILLAN, R. G. **Timber extraction in Nyasaland by Wyssen skyline crane.** *Emp. For. Rev.* 32 (2), 1953 (148–50 + 6 photos).

An historical account of the events leading up to the installation of cableways on Mlanje and Zomba, which are now successfully extracting timber from these mountains.

3431. MILLER, M. S. Trelevka lesa podvesnym sposobom. **[Timber yarding by a skyline system.]** *Lesn. Prom.* 11 (5), 1951 (11–3). [Russ.]

Describes the results of tests on the use of a cableway set-up for skyline skidding, developed in Siberia, and tested on slopes of 20–28°. The skyline has a travelling carriage and provision for tautening. The end of the main cable is secured to the carriage, passes through a block to which the load is attached, and then, through a second block on a spar tree, to one winch drum. The haulback cable, one end of which is fixed to the load-carrying block, passes through system of pulleys back to the second drum of the winch. Comparative tests show that this method gives better results than high-lead systems.

3432. CEHANOVSKIĬ, A. I., BEKETOV, S. P., and ZELJDIČ, P. N. Trelevka lesa lebedkoĭ s beskonečnym trosom. **[Winch skidding of logs with the aid of a monocable.]** *Lesn. Prom.* 12 (1), 1952 (8–10). 1 ref. [Russ.]

Illustrated description of a lay-out for the ground-skidding of tree-length logs along a cleared track of ca. 1 km., tested in summer 1951 at the Timiryazev Lespromkhoz (Siberia, river Tom). The logs were extracted from a 90% Pine/10% Birch (3rd site class) stand, aged 120–140 years; the average d.b.h. was 24 cm., average log volume 0·5 cu.m.; standing volume 150 cu.m./ha. The country was undulating, with bogs and sandy ridges. The winch used had 2 drums, and the following characteristics: pull 10,000 kg.; drum diam. 65 cm., motor power 45 KW. and speed 960 rev./min. The endless steel cable was 2100 m. long and 2·4 cm. thick; its rate of travel 60 cm./sec. The cable, with clamps for the choker-lines, moved continuously in one direction; as the logs arrived, the choker-lines were detached and transferred to the clamps on the returning side of the cable. Special star-shaped blocks were used where the cable turned at a right angle near the winch. Apart from a set of blocks for the tautening device, the cable passed only through 2 blocks at the farthest end and 2 star-shaped blocks near the winch. The 8-hour output is estimated at 90 cu.m. for less than 300 m., 65 cu.m. for 300–600 m., and 50 cu.m. for 600–1000 m. skidding distance.

3433. **The Oliver logger.** *Emp. For. Rev.* 32 (2), 1953 (102–3 + photo).

Descriptive note, with photograph, of a logger designed for use by the Forestry Commission for the extraction of thinnings and light timber and now available commercially. It is produced by J. C. Oliver Ltd. of Leeds. It can take loads up to 2 tons.

3434. MARTINI, Z. Badania oporów wozów ogumionych. **[Investigations on the tractive force for tyred carts [in timber transport].]** *Prace Inst. Bad. Leśn.* No. 82, 1952. pp. 40. 6 refs. [Pol.pol.russ.]

Presents results of tests carried out in 1948 with pneumatic-tyred and iron-tyred carts on different roads and slopes, with different tyre pressures; the tractive force of the caterpillar tractor used was measured by means of a recording dynamometer; the speed varied from 0·83 to 1·05 m./sec. It was found that: (1) the use of pneumatic tyres on soft soil reduces the tractive force by 26–56% (as the tyre pressure varied from 4·5–1·5 atm.) compared with a cart with iron tyres; (2) pneumatic-tyre pressure should be greater on hard roads than on soft roads; (3) carts for tree-length logs should have large-diameter rear wheels; (4) iron-tyred wheels require a lower tractive force than pneumatic-tyred wheels on hard soil, but, to obtain smooth motion, the latter are recommended for horse traction; (5) the ordinary farm cart requires, on soft soil, 4 times the tractive force of a pneumatic-tyred cart.

3435. **Pulpwood loader with special boom.** *Paper Tr. J.* 136 (14), 1953 (32). P.R.

A lift lorry with special boom attachment and 13,300-lb. loading capacity.

3436. LUKJJANČIKOV, S. Vintovoĭ brevnopogruzčik. **[Helical log-loader.]** *Lesn. Prom.* 12 (2), 1952 (15–6). [Russ.]

Illustrated description of a loading-hoist designed by M. G. Lubenskiĭ and used at the Udim Lespromhoz of the Ustjugles. It consists of a pair of ramps each of which is formed of an [iron] pipe 5 cm. in diam. and 5 m. long, round which a tube of 15 mm.

external and 10 mm. internal diam. is wound helically and fixed by spaced welded connexions, so as to form a kind of screw of 18 cm. diam. and 25 cm. pitch. The screw of one ramp is wound clockwise, that of the other, anticlockwise; these, which on rotation hoist the logs, are driven by the motors of CNIIMÈ-K5 or VAKOPP electric saws, run at 19 rev./min. The maximum carrying capacity is 1000 kg., max. log diameter 28 cm., log travel speed 4·75 m./min. and max. height of hoisting 2 m. Each screw ramp weighs 80–90 kg. The output of this device is 120 cu.m./shift, with 4 operators.

3437. Rahmanov, S. I. Krany ili lebedki? [**Cranes or winches?**] *Lesn. Prom.* 12 (2), 1952 (10–3). [Russ.]

Time studies conducted in several forest enterprises in Russia have shown that winches with a derrick arm (the TL-3 as well as the two-drum winches) work far more economically than cranes (electric or other) for loading logs on wagons. When used for loading logs on to standard-gauge wagons, the output of winches is much greater (by ca. 45% per machine-shift, and 75% per man-shift) than that of cranes. The difference is still greater (ca. 100–150%) when winches and cranes are used for loading logs on to trailers or narrow-gauge flats.

378. *Water Transport*

See also No. 3452.

3438. Smedberg, M. Flottning i Tyskland, Österrike och Jugoslavien. [**Floating in Germany, Austria and Jugoslavia.**] *Årsb. svenska Flottledsförb.* No. 26, 1952 (4987–93). 1 ref. [Sw.]

3439. Esseen, G. Virkesutrullning—försök med nya metoder. [**Launching timber—experiments with new methods.**] *Årsb. svenska Flottledsförb.* No. 26, 1952 (4984–6). 4 refs. [Sw.]

Illustrates with photographs and diagrams some new methods, none completely successful, of stacking and of launching wood into the water without the present excessive expenditure of time and labour.

3440. Lavoie, G. **Watering pulpwood**. *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1284 (*B*–9–*a*), [1953]. pp. [4].

Describes, with illustrations, equipment consisting of a large rake, tractor, winch and A-frame, used for dislodging into the river piles of pulpwood dumped along the banks, and gives details of costs.

3441. Putkisto, K. Tutkimuksia puutavaran vedestä nostosta. [**Investigations into the lifting of timber from water.**] *Julk., Metsäteho, Helsinki* No. 30, 1953. pp. 177. 40 refs. [Fi.e.]

Tabulates the results of work studies on lifting practices used by different firms using: a steam-operated crane to lift pulpwood bundles from the water on to railway trucks; trolleys drawn by machine winch to lift pulpwood and pitprop bundles and unbundled 2- and 4-m pulpwood from the water, followed by hand-loading on to railway trucks or hand-piling on land; a horse-operated capstan to lift logs from the water on to railway trucks; and an electric crane for the same purpose. Figures given include the effective and non-effective working time per man for the different methods; the relative effective working time for the machines and the horse; the time per work team and per man/cu.m. piled measure; the amount lifted per day and per man in cu.m. piled measure; relative wages and the average working-site time per log and per bundle. Recommendations are made on choice of lifting site. Choice of method will depend on such factors as quantity and nature of timber to be handled, the need for sorting, and whether timber is to be loaded into railway trucks or lorries or to be stored. The organization of work when trolleys drawn by machine winch are used is discussed. Photographs, diagrams, graphs and summary tables have English legends. *From author's summary.*

3442. Delfs, J. Die Flösserei im Stromgebiet der Weser. [**Timber rafting on the Weser and its tributaries.**] *Veröffentlichungen des Niedersächsischen Amtes für Landesplanung und Statistik, Hannover (Ser. A)* No. 34, 1952. pp. 125 + 4 plates. 78 refs. [G.]

A dissertation covering the historical development of rafting and floating in this region, the technique of raft-building and rafting, trade in rafted timber and rafting as an occupation. River development projects and improvements in shipping facilities make it improbable that rafting will continue much longer.

3443. Arnšteĭn, G. È. Rekonstrukcija plotovogo splava v uslovijah 'Boljšoĭ Volgi'. [**Modified rafting practice on the Greater Volga.**] *Lesn. Prom.* 12 (2), 1952 (18–23 + 1 photo). [Russ.]

Owing to the various waterway improvement projects, some of them completed, others under construction, several reaches of the Volga and Kama will become lakes, thus making it necessary to introduce alterations into the design of rafts. The possible rafting units (single-log-length bundles, long cigar-shaped bundles of ca. 32·5 m. length, and sea-going cigar-shaped rafts), as well as the recommended raft-assembly systems (short or long bundles in sections) are discussed at some length.

3444. Osipov, M. E. Splav lesa v hlystah [**Rafting of tree-length logs.**] *Lesn. Prom.* 12 (7), 1952 (15–8). [Russ.]

Describes the experimental rafting of tree-length logs in 1951 on the Volga and Kama rivers. The rafting units were bundles 20 m. long, 5 m. wide, and 2 m. high, of 90–100 cu.m. volume. Logs of 16 to 88 cm. butt diam. were incorporated into one bundle, the top ends being cut to give top diameters not less than 10–16 cm. The best binding was found to be a combination of steel cables with chains. The technique of bundling and rafting, and that of sorting at the receiving end, are described in some detail.

3445. Pöllänen, K. Eräitä ajatuksia muutamista puutavaran järvikuljetuksia koskevista kehityspyrkimyksistä. [**Trends of development in transporting timber across lakes.**] *Årsb. Finl. Flottareförening.* No. 21, 1952 (36–46). [Fi.e.]

Includes discussion on bundling logs, and on the water transport of bundled logs.

3446. Laukkanen, V. Nippu-uiton suunnittelu Oulujoen vesistössä. [**The planning of floating in**

bundles on the River Oulujoki water system.] *Årsb. Finl. Flottarefören.* No. 21, 1952 (47–53). [Fi.e.]

Discusses problems created in floating by the use of the river for hydro-electric supplies, the introduction of bundle-floating, and the establishment of adequate portage facilities when power stations are built.

3447. Stenerud, O. Fløtning av bil- og jernbanebunter i kanaliserte vassdrag. [**Floating bundles consisting of lorry or railway-wagon loads in canalized waterways.**] *Årsb. svenska Flottledsförb.* No. 26, 1952 (4950–1). 8 refs. [Nor.]

Gives figures, based on 4 years' experience [in Norway], of the costs of floating bundled lorry and railway-wagon loads, 4–8 bundles being linked to form rafts.

3448. **Decay in Red Spruce and Balsam Fir pulpwood in relation to its floatability.** *Rep. Ntheast. For. Exp. Sta. 1952*, 1953 (30–1).

Partial analysis of data from field studies gave the following results: (1) Sinkage losses were greater for Balsam Fir than Red Spruce. (2) In both species losses were higher for partly decayed than for sound bolts. (3) Bolt position in the stem was an important factor, sinkage losses increasing with height up the tree. (4) Seasoning increased floatability, sinkage rate in freshly cut logs being 5 times greater than in those left to season from July until spring. (5) In unseasoned bolts losses were about equal for barked and unbarked bolts, but in seasoned bolts losses of unbarked were about 10 times those of barked bolts. [Cf. *For. Abstr.* 14 (No. 1269).]

3449. Mučnik, S. Ja. Naklonnye zapani na rekah s boljšimi skorostjami tečenija. [**Oblique terminal booms on rivers with a rapid current.**] *Lesn. Prom.* 12 (2), 1952 (23–5). [Russ.]

Illustrated description of an oblique boom specially designed for the landing of logs floated on the river Ingur (Caucasus) just below its confluence with the Magana. On mountain rivers like the Ingur, having a current of ca. 4–5 m./sec., it is not advisable to construct booms of the usual type, because of high construction costs and increased jamming of logs. The oblique boom used (in which the gate is arranged obliquely to the direction of flow) serves in this particular case as a log-stopping and diversionary device. The length of the boom is 580 m.

3450. Granberg, J. H. Nytt bomkoppel. [**A new boom coupling.**] *Årsb. svenska Flottledsförb.* No. 26, 1952 (4983). 3 refs. [Sw.]

Describes with illustrations a boom-coupling (Swedish Patent No. 133850) consisting of two right-angled hooks linked by a chain. The point of each hook is driven vertically into a log and a V-shaped peg, also linked to the hook, is driven in so that it straddles the horizontal part of the hook and holds it in position.

3451. Heiskanen, V. Tutkimuksia pinopuutavaran proomuun lastauksesta. [**Time study of loading stacked wood into barges.**] *Acta for. fenn.* 58 (1), 1951. pp. 49. 20 refs. [Fi.e.]

Has a fairly full English summary, and English as well as Finnish legends to tables and diagrams.

38. FOREST ENGINEERING

381. *Materials (including Explosives and their Use)*

See also No. 3424.

3452. Hakkarainen, A. E. [Editor]. Räjähdysaineet ja niiden käyttö metsätaloudessa. [**Explosives and their use in forestry.**] Metsätehon Oppaita, Etelä-Esplanaadikatu 2, Helsinki. 1953. pp. 98. 36 refs. [Fi.]

Describes different explosives and the manner of firing charges, methods of boring, setting the charges and transporting and storing explosives; and methods of blowing up rocks, tree trunks, earth and ice. Particulars are given of work under water. A chapter deals with the use of explosives in rolling logs into the water, and splitting and breaking trees. Finnish regulations for the use of explosives are also listed.

383. *Roads and Bridges*

3453. Puun maakuljetusolojen kehittäminen. [**Development of land transport of wood.**] *Silva fenn.* No. 73, 1952. pp. 72 + map. [Fi.e.]

The first report of a committee appointed to advise the government on improvements and extensions of the system of forest roads and railways in Finland. A map showing the proposals is included.

3454. Masani, N. J. **Lecture notes on simple calculations in the design of forest bridges of stock spans of 15, 20, 30 and 40 ft.** Manager of Publications, Delhi. 1952. pp. 172. Price *Rs.*6·14 (10*s.* 6*d.*)

Reprinted in book form from the *Indian Forester.* [Cf. *For. Abstr.* 13 (No. 1278).]

385. *Drainage, Irrigation, Sedimentation*

3455. Tirkkonen, O. O. J. Suomen metsäojitus 1900-luvun alkupuoliskolla. [**Forest swamp drainage in Finland in the first half of the 20th century.**] *Silva fenn.* No. 72, 1952. pp. 103. 11 pp. of refs. [Fi.e.]

Stresses the financing of drainage operations in both state and private forests. The total area drained up to ca. 1940 was 755,892 ha., representing 110,919 km. of drainage ditch.

See also Nos. 3137, 3615.

3456. Uslu, M. Türkiyede orman tahrip faktörleri: tesir dereceleri, her faktör için bu güne kadar alınmış bulunan kanunî ve teknik tedbirlerle sonucları, teklifler. **[Destructive agencies in Turkish forests: their effects, results of legislative and technical countermeasures to date, and recommendations.** *Tar. Bak. Orm. gen. Müd. Yay.* No. 98, 1951. pp. 148. 30 refs. [Turk.]

Includes sections on grazing, deforestation, fires, uncontrolled exploitation, wasteful utilization, beetle pests.

3457. ***Tree Pest Leaflets, Hillsboro, N.H.*** Nos. 1 . . . 56 (rev.) 1950–52. Each 3–6 pp.

[Cf. *For. Abstr.* 1 (pp. 295–7).] The revised issues deal with: (1) *Adelges cooleyi*; (2) *Bucculatrix canadensisella*; (3) *Rhyacionia buoliana*; (4) *Cryptococcus fagi*/*Nectria coccinea* var. *faginata*; (5) *Malacosoma* spp.; (7) *Pissodes strobi*; (8) *Glycobius speciosus*; (9) *Galerucella xanthomelaena*; (10) *Chermes piceae*; (13) *Hylobius pales*; (14) *Dendroctonus piceaperda*; (15) Pine sawflies; (16) Cedar-apple rust (*Gymnosporangium* spp.); (17) *Fomes pini*; (18) *Fomes annosus* and *Polyporus schweinitzii*; (19) *Verticillium albo-atrum* and *Dothiorella ulmi*; (20) *Fomes igniarius*; (21) *Armillaria mellea*; (22) *Tetranychus* and *Paratetranychus* spp.; (24) *Aphrophora parallela*; (25) *Lymantria dispar*; (26) *Cronartium ribicola*; (28) *Dasyscypha willkommii*; (29) *Alsophila pometaria*, *Paleacrita vernata* and *Operophtera bruceata*; (31) Spraying and dusting to control insects and diseases (information on insecticides and fungicides); (32) *Strumella coryneoidea*; (33) Nature of fire damage to Northeastern forests; (34) *Gilpinia hercyniae*; (38) *Fomes connatus*; (40) Forest and shade-tree aphids; (44) Needle-cast diseases of conifers; (46) Arborvitae leaf-miners; (47) *Reticulitermes flavipes*; (48) *Gnomonia veneta*; (51) Hemlock loopers (*Ellopia* spp.); (53) Ants (*Formica exsectoides* and *Camponotus herculeanus*); (54) Control of . . . insects with concentrated sprays applied by mist blowers; (55) *Chalara quercina*; (56) *Fenusa pusilla.*

41. GENERAL TECHNIQUE OF FOREST PROTECTION. TYPES OF INJURY

411. *Natural and Biological Control*

See Nos. 3025, 3516–20, 3526–9, 3531, 3534, 3547, 3550, 3554, 3556, 3568–9, 3572–3.

413. *Physical and Mechanical Control (Trapping etc.)*

See Nos. 3539, 3548–9, 3567.

414. *Chemical Control*

See also Nos. 3520–2, 3560.

3458. Potts, S. F., and Spencer, R. A. **Air-blast spraying apparatus for helicopters.** *J. econ. Ent.* 46 (1), 1953 (147–50).

Until now no suitable apparatus for finely atomizing sprays has been available for use on helicopters. An apparatus is here described, which will give a range of droplet diameter of 40–60μ. A device is also described for simultaneously applying dust and spray by coating the dust with spray liquid.

42. INJURIES FROM INORGANIC AGENCIES OTHER THAN FIRE

422. *Temperature Influences. Frost. Heat. Drought*

See Nos. 3032, 3150, 3270.

424. *Soil Conditions. Erosion Effects*

See also No. 3153.

3459. Smith, C. M. **Fused needle disease in Pines.** *Emp. For. Rev.* 32 (2), 1953 (172–3 + 1 photo).

Referring to a previous article [cf. *For. Abstr.* 14 (No. 2345)] on 'fused-needle disease' in *P. palustris*, the writer points out that the condition shown in the illustrations to that article is not needle fusion but a different and harmless condition which he calls 'crumpled needle'. He gives photographs of genuine needle fusion on *P. radiata.*

3460. Wilson, C. C. **The response of two species of Pine to various levels of nutrient zinc.** *Science* 117 (3035), 1953 (231–3). 8 refs. O.R.S.

Two-month-old seedlings of Loblolly and Shortleaf Pines were grown in special containers for 1 year and treated twice weekly with nutrient solutions including concentrations of 0·001, 0·01 and 0·1 p.p.m. Zn. One plant of Loblolly and one of Shortleaf Pine were planted in each container, and 4 containers were used for each concentration. The responses of the two species were very different. At the end of 1 year, all Loblolly seedlings were alive and growing; the plants in the series without Zn were about half as tall as those in the high-Zn series, had shorter needles and exhibited some chlorosis, the plants in the two intermediate series showed some diminution of terminal bud growth and needle extension, and slight chlorosis compared with those in the high-Zn series. The Shortleaf seedlings in the series without Zn were all dead at the end of 8 months, having made practically no growth, their needles were very short and they exhibited extreme chlorosis. Three of those in the 0·001 p.p.m. series were dead by the end of the year; only one of those in the 0·01 p.p.m. was dead but the remaining seedlings showed reduced bud growth and needle extension, and severe chlorosis. All the seedlings in the high-Zn series were alive and healthy. The symptoms of Zn deficiency closely resemble those described for the littleleaf disease of the two species in the Piedmont area.

3461. Carpenter, I. W., Jr. **Iron deficiency in Pin Oak.** *Abstr.* in *Proc. Indiana Acad. Sci.* 61, 1951 (1952), (67). A.P.B.

Quercus palustris frequently develops Fe deficiency symptoms when planted on calcareous soils. A laboratory experiment was made to study the effect of pH on the availability of Fe to young *Q. palustris* seedlings. At pH 7·0 a nutrient solution cottaining 10 times the normal concentration of Fe produced chlorosis, and chlorosis was acute in a solution containing 1 p.p.m. Fe; but at pH 5·0 the latter solution produced normal plants. The chlorotic condition of deficient leaves was corrected by painting them with a 3% solution of $FeSO_4$. This sprayed on Fe-deficient trees was also a corrective.

43. FOREST FIRES

431. *Predisposing Factors and Causes. Fire Danger. Fire Behaviour*

3462. C. Z., J. Quemas e incendios forestales. **[Burning and fires in the forest.]** *Agric. venez.* 17 (158), 1952 (39–43). [Span.] A.P.B.

Describes some causes of forest fires in Venezuela, and states the case against burning for agricultural or other purposes.

432. *Prevention and Control*

See also No. 3399.

3463. BANGSBERG, R. C. **XZIT—its effect on the railroad fire problem.** *Fire Control Notes* 14 (2), 1953 (36–8).

The Southern Pacific Railroad, which has 116 miles of main line running through the Shasta National Park, tried the experiment in 1951 of adding a carbon-reducing agent called XZIT [composition not stated] to the fuel oil burnt in their diesel locomotives. There were no fires caused by sparks in that year, and the Railroad company is now going to use XZIT throughout the year regardless of fire season.

3464. RICARD, L. Création d'un pare-feu à l'aide d'un tracteur. **[Making a firebreak with the help of a tractor.]** *Rev. for. franç.* 5 (1), 1953 (11–12 + 2 photos). [F.]

Describes the use of a Ford-Ferguson tractor fitted with a 1·9 m. cutting bar, to clear vegetation from firebreaks round plantations.

3465. EMERSON, W. J. **Sirens on airplanes summon woods workers for fire fighting.** *Fire Control Notes* 14 (2), 1953 (25–7).

3466. JAEGER, J., JR. **'Little Lulu' mechanica fire line raker.** *Fire Control Notes* 14 (2), 1953 (39–41).

Describes the adaptation of a motor mower to a mechanical fire-line rake for use in hardwood litter. Results of its use on actual fires have been very encouraging, it makes a fire-line 12 in. wide at a rate varying from 2 chains/3 min. in open forest to 1 chain/3 min. in thick broomsedge with hardwood reproduction.

3467. FENNER, R. L. **A safe cheap and effective forest fire grenade.** *Fire Control Notes* 14 (2), 1953 (22–4).

A grenade has been developed by the California Forest and Range Experiment Station, that is safe to use and cheap to make. It provides a fast, sure way of igniting grass, Pine needles, dead leaves etc. from a distance of 200 ft. The grenade and its use are described in some detail.

435. *Benefits of Fire Control. Injurious Effects of Fire. Fire Losses*

See Nos. 3456–7, 3462, 4036.

436. *Beneficial Effects of Fire. Uses of Fire in Silviculture and Other Forms of Husbandry*

See also No. 3244.

3468. YOUNGBERG, C. T. **Slash burning and soil organic matter maintenance.** *J. For.* 51 (3), 1953 (202–3).

The rule of the Weyerhaeuser Timber Co. is not to burn slash until 4–5 in. of rain has fallen in the autumn. This prevents damage to the humus layer, whereas burning directly after logging may reduce organic matter in the top 3 in. of soil from 12–15% to 3–8%.

44. DAMAGE BY HARMFUL PLANTS. VIRUS DISEASES

441. *Weeds*

See also Nos. 2971, 3313, 3378–84.

3469. PERERA, S. P. **A cheap and effective method of eradicating illuk (*Imperata cylindrica*).** *Ceylon Forester* 1 (1), 1953 (39–41).

I. cylindrica has been successfully suppressed in a heavily infested plantation, by planting branch cuttings of *Gliricidia maculata* at a spacing of ca. 4 ft. Mature branches 1½–2 in. in diameter were cut into 4-ft. sections with a clean, slanting cut and planted in holes 9 in. deep. All leaves were removed from the part to be buried and the leaves in the upper part reduced by one half. Side branches developed in ca. 6 months and close cover in ca. 12 months. After ca. 18 months the *I. cylindrica* had almost completely disappeared. In addition to eradicating the grass, the *Gliricidia* considerably improved the soil, to the great benefit of the growth and vigour of the *Artocarpus* and *Melia* spp. growing above it. It is now standard practice to use *Gliricidia* to eradicate *Imperata* in the plantations of the wet and intermediate zones of Ceylon.

3470. STREGE, B. **Chemicals prove effective in brush control.** *Lumberm.* 80 (2), 1953 (58–9, 106).

Good results were obtained by spraying with Esteron Brush Killer (a mixture of 2,4-D and 2,4,5-T) at a concentration of 10 qt./500 gal., and fair results with 5 qt./500 gal. Esteron 44 (an ester of 2,4-D) gave good results against Alder and Willow at a concentration of 4 qt./500 gal. Some figures are given for cost of spraying 60 miles of roadside brushwood.

442. *Parasitic (Higher) Plants. Climbers and Epiphytes*

3471. BOURCHIER, R. J. **Dwarf mistletoe on Spruce in Alberta.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 9 (2), 1953 (4).

A species of dwarf mistletoe found attacking *Picea glauca* in Alberta is believed to be not the usual *Arceuthobium pusillum* found on this species in the East, but *A. americanum*, the Lodgepole Pine mistletoe, not hitherto recorded on Spruce.

3472. Thomas, R. W. **Forest disease survey: Parasite on Jack Pine mistletoe.** *Rep. For. Insect Dis. Surv. Can. 1952*, 1953 (94).

Observations on the fungus parasite *Wallrothiella arceuthobii* on *Arceuthobium americanum* indicate that it may be of more importance than was previously believed. It occurs on dry as well as damp sites and appears to restrict the development of mistletoe seeds in some regions.

443. *Fungi and Bacteria*

See also Nos. 3052–4, 3073–9, 3388, 3457.

3473. Sawada, K. **[Researches on fungi in the Tohoku district of Japan (III). Uredinales.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 57, 1952 (7–85). [Jap.]

Lists, with an index, 282 species and their hosts. [Cf. *For. Abstr.* 14 (No. 1308).]

443.2. Diseases of Seed and Seedlings; Damping Off etc.

See also Nos. 3349, 3513.

3474. Goui, G., and Caro, S. di. Presenza dell' *Ophiostoma fagi* Loos su castagne. **[The occurrence of *O. fagi* on chestnuts.]** *Ann. Sper. agr.* 7 (1), 1953 (211–9). 4 refs. [It.it.e.] C.G.B.

A bluing fungus, *O. fagi*, has been found in the fruit of *Castanea sativa*, associated with holes, probably of insect origin. This is the first recorded occurrence of this fungus in Italy.

3475. Vaartaja, O. **Disease caused by weak parasites associated with shade in seedbeds.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 9 (2), 1953 (3–4).

Scots Pine seedlings in nursery seedbeds at Indian Head died in patches, and those that did not die in these patches showed various abnormalities. The disorder occurred only where double lath at the junction of two screens caused heavy shade. It is supposed that it was due to the combined effect of shade and weak parasites. [Cf. *For. Abstr.* 14 (No. 1310).]

3476. Gatteschi, P. Una moria di piantine di *Eucalyptus* in vivaio. **[A disease of nursery seedlings of *E. globulus*.]** *Monti e Boschi* 4 (2), 1953 (74–6). [It.f.e.]

One-year-old plants of *E. globulus* in a nursery in Sicily died in the late autumn after the appearance of necrotic patches on the stem and withering of the tops. *Botrytis cinerea* was isolated from the affected plants, but artificial inoculation in the following spring failed to reproduce the disease. It is believed that *B. cinerea* acts as a parasite only when plants are weakened by adverse environmental conditions.

3477. Sy, M., and Thielicke, W. Weitere Bekämpfungsversuche gegen Eichenmehltau. **[Further experiments in the control of *Microsphaera quercina*.]** *Forst u. Holz* 8 (11), 1953 (151–3). [G.g.]

[Cf. *For. Abstr.* 14 (No. 429).] Trials were continued in 1952. Good results were obtained with 2 sprayings, but 4 sprayings were even more effective. Three spraying sufficed if the outbreak did not begin until midsummer (i.e. the end of June or beginning of July). Effective control produced an increase in growth in comparison with untreated trees.

443.3. Diseases of Older Stages

Stem, Butt and Root Rots; Root Diseases

See also Nos. 3073, 3075, 3193–4.

3478. Basham, J. T., Mook, P. V., and Davidson, A. G. **New information concerning Balsam Fir decays in eastern North America.** *Canad. J. Bot.* 31 (3), 1953 (334–60 + 29 photos). 27 refs. O.R.S.

From investigations in New Brunswick, Maine and Ontario the following were identified as the most frequent causes of different types of rot in *Abies balsamea:* trunk rot—*Stereum sanguinolentum*; white stringy butt rot—*Corticium galactinum, Odontia bicolor, Poria subacida, Armillaria mellea* and *Omphalia campanella*; brown cubical butt rot—*Coniophora puteana, Polyporus balsameus,* and *Merulius himantioides.* Figures showing the frequency of different types of butt rot on two different sites types are tabulated [cf. *For. Abstr.* 2 (18)]. Brown cubical rot was commoner on 'mixedwood slopes' (15·2% trees affected) than on 'softwood flats' (2·7%) and the same was true of white stringy rot (51·7 and 39·9% respectively), but red butt rot was less common on mixedwood slopes than on softwood flats (1·5 and 2·8%). *M. himantioides* and *A. mellea* were found most frequently on softwood flats and *Poria subacida* on mixedwood slopes. Stem rot caused by *S. sanguinolentum* occurred on an average in 18–19 ft. of the length of infected trees. White butt rots extended on an average 5·1, and brown butt rots 3·7 ft. above ground level; no significant difference was found in type of rot as related to average diameter and age of trees. Of the white butt rots, *Omphalia campanella* occurred in trees averaging 120 years and the other fungi in trees of 85–95 years. In dead trees, during the first year, stain caused by *Stereum chailletii* was observed; in subsequent years this was succeeded by white stringy rot from *Polyporus abietinus* with a small proportion of brown cubical rot caused by *Fomes pinicola, Coniophora puteana* and *Lenzites saepiaria,* and occasional heart rot caused by *S. sanguinolentum* and *Corticium galactinum.*

3479. White, L. T. **Studies in forest pathology. X. Decay of White Pine in the Timagami Lake and Ottawa valley areas.** *Canad. J. Bot.* 31 (2), 1953 (175–200 + 12 photos). 6 refs. O.R.S.

Of 1012 trees examined in ten 1-acre plots in even-aged White Pine stands, 52% contained decay. A well defined relationship existed between age and decay. The incidence of decay rose gradually from 40% in the 60-year class to 100% in the 220-year class, and loss in merchantable volume from 4% at 60 years to 40% at 200 years. No consistent relationship between decay % and diameter was found; the number of trees infected was about the same in

slow- and fast-growing trees but the % volume lost by decay was considerably higher in slow-growers. The 'pathological' rotation as indicated by net p.a.i. data was 160–170 years. Some methods of estimating the volume of decay in logs are compared. Regression lines defining the % of cull allowances at all ages are presented. Thirteen wood-destroying fungi were found to be associated with the decay of living White Pine in Ontario. *Fomes pini* caused 90% of all loss in trunks and butts of living trees. External signs of decay were rare except in cases of advanced white pocket rot caused by *F. pini*. *From author's summary.*

3480. Wallis, G. W. **Root rot of Douglas Fir [in British Columbia].** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 9 (1), 1953 (4).

Comparison of sporophores of a fungus causing root rot of Douglas Fir with those of *Poria weirii* on *Thuja plicata* showed that, with the exception of viability and regional distribution, there was no significant difference between the two.

3481. Foster, R. E., and Foster, A. T. **Estimating decay in Western Hemlock. (II). Suggested aids to the inventory in the Queen Charlotte Islands.** *B.C. Lumberm.* 37 (4), 1953 (40–1, 56, 58, 102). 6 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 76).

[Cf. *For. Abstr.* 14 (No. 2381).] Gives figures showing approximate amounts of pulpwood available from understorey trees in the diameter range 6–14 in. and discusses Scandinavian experiments on pulping Spruce decayed by *Fomes annosus* [cf. *For. Abstr.* 12 (No. 519)] and their possible relevance for Canada.

3482. Rennerfelt, E. Om angrepp av rotröta på tall. **[Root-rot attack on Scots Pine.]** *Medd. SkogsforsknInst., Stockh.* 41 (9), 1952. pp. 40. 29 refs. [Sw.e.]

Damage to Pine by *Fomes annosus* is fairly common in S. Sweden, usually in stands planted on sandy sites, formerly used as arable land, in fairly dry areas; it is also found in heathland plantations and occasionally in naturally regenerated Pine. The attack begins among 15- to 20-year trees and reaches its maximum at 30–40 years. An examination of a number of infected sites showed that drainage was good and the water-table low. The pH values were variable, 5–6 being the most usual, but they did not differ as between adjacent infected and non-infected sites. The humus layer was usually thin, generally 2–5 cm., and of poor quality. The sand was sometimes comparatively rich in CaO and poor in P, K and N. Attack was generally found to originate in stumps after felling [cf. *For. Abstr.* 12 (No. 2343)] but examples were also found in untouched stands. The occurrence of the mycelium in root systems of some individual trees in a 20-year stand was investigated and is shown diagrammatically. Growth of the mycelium in flasks containing soil samples was appreciable only for the humus layer. It is considered improbable that the mycelium can grow in soil alone.

Stands on poor sandy soils not infected by *F. annosus* are generally not of first-generation Pine. An experiment has been established to determine the value of preserving stumps against attack, and the effect of felling at different seasons. The regeneration of infected areas is discussed. Self-sown Pines in root-rot districts have been killed in as little as 5 years, and Pine should not be planted again on infected sites. *Larix decidua* and *L. leptolepis* are fairly resistant but have been severely attacked in some districts and in any case are not suitable for these poor sandy soils. *Betula* spp. are attacked on sites of this type. *Fagus sylvatica*, *Quercus robur* and probably *Q. borealis* resist attack.

There is a full English summary and legends to illustrations and tables are in English.

3483. Wiehe, P. O. **The spread of *Armillaria mellea* (Fr.) Quel. in Tung orchards.** *E. Afr. agric. J.* 18 (2), 1952 (67–72). 5 refs.

Aleurites montana plantations in Nyasaland are seriously affected by *A. mellea* root-rot, the source of infection usually being surviving indigenous trees of the *Brachystegia/Isoberlinia* woodland or their old stumps and roots. Experimental ring-barking of such trees two years before planting Tung, in order to deplete starch resources in the roots and so render them less propitious to the fungus, gave good results: at 8 years old, orchards established after ring-barking showed only 1·8% trees infected compared with 19·4% in an orchard established immediately after felling untreated woodland.

3484. Woods, F. W. **A recent historical factor in the determination of forest composition.** *Abstr.* in *Journal of the Tennessee Academy of Science, Nashville* 27 (3), 1952 (207–8). L.S.

Considers the part played by 'ink' disease (*Phytophthora cinnamomi*) in the recession of *Castanea dentata* from the southern part of the U.S.A. since the beginning of the 19th century.

3485. Quirke, D. A. **Forest disease survey: *Polyporus obtusus* Berk.** *Rep. For. Insect Dis. Surv. Can. 1952*, 1953 (73).

This fungus was, until 1949, recorded in Canada only on *Quercus* spp. It has now been found on White Elm.

3486. Teixeira, A. Ribeiro. A podridão amarela do 'pau-jacaré'. **[Yellow rot of *Piptadenia communis*.]** *An. bras. Econ. flor., Inst. nac. Pinho* 4 (4), 1951 (238–46). 12 refs. [Port.e.]

In 1943 a fungus attacking *P. communis* was noticed in Campinas. Attack was confined to this species and to trees over 8–10 years old, causing defoliation, progressive die-back of twigs and branches, and discoloration of the heartwood. The disease seems to be confined to São Paulo. The pathogen was found to be a new species of *Phellinus*, named by the author *P. piptadeniae*, a description of which is given. Affected parts of the trees should be removed and burnt, and wounds treated with equal parts of asphalt and creosote, or with a 2/1000 solution of $HgCl_2$, followed by an application of thin varnish or oil paint.

Wilts, Diebacks, etc.

See also Nos. 3076–7, 3486, 3559.

3487. Berthon, R.; Moreau, C., and Moreau, M.; Millischer, H. Les maladies du châtaignier

en Forêt de Marly. **[Diseases of *Castanea sativa* the Forest of Marly.]** *Rev. for. franç.* 5 (6), 1953 (411–5). 6 refs. [F.]

Chestnuts in this forest near Paris are suffering from a sudden and rapid die-back, the symptoms of which are described. Examination revealed the presence of two parasitic fungi; *Diplodina castaneae* (cause of the 'javart' disease of Chestnuts) and *Crytodiaporthe castanea*; and also of several saprophytes which are believed sometimes to become parasitic. Further research is in progress. Meanwhile it appears likely that *D. castaneae* may be acting as a primary parasite, favouring the attack of *C. castanea*, and that the death of the trees is due to this combined attack.

Cankers, Stem Rusts etc.

See also Nos. 3053, 3079, 4049–50.

3488. Plasman, A. Note sur la découverte en Belgique de *Phomopsis pseudotsugae* Wilson sur *Pseudotsuga taxifolia* (Lam.) Britt. **[The discovery of *P. pseudotsugae* on *P. taxifolia* in Belgium.]** *Repr.* from *Parasitica, Gembloux* 9 (1), 1953 (1–5). 11 refs. [F.]

3489. Moreau, C., and Moreau, M. La 'suie' des sycomores à Paris. **[Sooty bark disease of Sycamore in Paris.]** *Bulletin de la Société Mycologique de France, Paris* 67, 1951 (404–18). 20 refs. [F.] O.B.D.

Sooty bark disease has been observed on *Acer pseudoplatanus* in Paris since 1947. A study was made of the dematioid form of the associated fungi, which proved to be *Cryptostroma* sp. [cf. *For. Abstr.* 13 (No. 3990)]. An ascophorous form also associated with the disease corresponds to *Eutypa acharii*. In culture the mycelia of these two forms cannot be distinguished, but they do not produce the same fructifications. The distribution and symptoms of the disease and the possible connexion between the two pathogens is discussed.

3490. Jacquiot, C. Maladie de la suie du sycomore (*Acer pseudoplatanus* L.). Étude anatomique du bois. **[Sooty bark disease of *A. pseudoplatanus*. An anatomical study of the wood.]** *Bulletin de la Société Mycologique de France, Paris* 67, 1951 (436–7). [F.] O.B.D.

Many of the cells in the infected wood were obstructed by gummy secretions, but there was an almost complete absence of tyloses. The wood was penetrated by various types of fungus filaments, and many of the cells were entirely delignified.

3491. Defrance, P., and Marion, J. L'*Hypoxylon mediterraneum* au Maroc. **[*H. mediterraneum* [on Cork Oak] in Morocco.]** *Ann. Rech. for. Maroc 1951*, 1952 (137–9). 1 ref. [F.]

Cf. *For. Abstr.* 13 (No. 2266).

3492. Brink, G. Verslag van het onderzoek naar de populierenkanker in 1947. **[Report on investigations in 1947 on bacterial canker of Poplars.]** *Mededelingen van de nederlandsche Heidemaatschappij, Arnhem* No. 8, 1949. pp. 10. [Du.e.]

Resistance tests were continued, but the warm, dry summer appeared to be unfavourable for the formation of canker. Many species of bacteria, one of which had some effect on *Populus candicans* but was not identical with *Pseudomonas rimaefaciens* already isolated, and some fungi were isolated from slime and diseased tissue. [Cf. *For. Abstr.* 9 (No. 2558).]

3493. Brink, G., and Ende, G. v. d. Verslag van het onderzoek naar de populierenkanker in 1948 en 1949. **[Report on investigations in 1948 and 1949 on bacterial canker of Poplars.]** *Mededelingen van de nederlandsche Heidemaatschappij, Arnhem* No. 13, 1951. pp. 15. [Du.e.]

Work continued on the same lines as hitherto [cf. preceding abstract]. On the whole, results of resistance trials for the two years agreed with previous results, but some shift in degree of susceptibility was noted for certain Black Poplars and is ascribed to the abnormal weather of 1947. Some varieties that have now proved susceptible to artificial infection, have never shown canker under natural conditions, e.g. *P. marilandica*, *P. serotina erecta*, *P. robusta* and *P. gelrica*. This fact is useful for comparisons of susceptibility: in a year when these varieties prove moderately susceptible to artificial infection, new types that also show moderate susceptibility should not be rejected as useless. Selection of hybrid seedlings was continued at Keppel, and the results are reported. Anatomical study of cankered tissues was resumed in 1948, and bacteria were found in the collenchyma of the branches.

3494. Bourchier, R. J. **Forest disease survey: yellow witches' broom of Spruce.** *Rep. For. Insect Dis. Surv. Can. 1952*, 1953 (123).

A malformation of branches and stems of the witches'-broom type caused by *Peridermium coloradense* is widespread on Spruce [*Picea mariana*, *P. glauca*, and *P. engelmanni*] in Alberta. It causes deformation of the bole and loss of increment, and apparently sometimes kills the infected tree.

Foliage Diseases

3495. Murray, J. S. **A note on the outbreak of *Chrysomyxa abietis* Unger (Spruce needle rust) in Scotland, 1951.** *Scot. For.* 7 (2), 1953 (52–6). 2 refs.

An outbreak of *C. abietis* in Scotland in 1951 is reported and an attempt made to associate it with the cold spring of that year. The parasitization of the rust by *Darluca filum* is noted.

3496. Ito, K., and Hosaka, Y. **Notes on some leaf-spot diseases of broadleaved trees II. *Septoria* leaf-spot of *Zelkowa serrata* Makino.** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 57, 1952 (163–86). 17 refs. [E.e.jap.]

3497. Fergus, C. L. **Relation of weather to the severity of White Oak anthracnose.** *Phytopathology* 43 (2), 1953 (103–5).

Further observations confirmed previous findings [cf. *For. Abstr.* 12 (No. 3406)] that severity of attack by *Gnomonia veneta* on *Quercus alba* is closely related to amounts of rain during late April and May. Severity in 1952 was greater in a park area where leaves and twigs were raked and removed than under natural forest conditions.

3498. NORDIN, V. J. **A leaf-spot disease of Aspen.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 9 (2), 1953 (4).

A leaf-spot disease of *Populus tremuloides* has reached epidemic proportions in Alberta. The causal fungus has been identified as *Marssonina tremuloidis.*

3499. SPRAU, F. Starkes Auftreten der Platanen-Blattnervenkrankheit im Bodenseegebiet. **[Severe outbreak of the leaf vein disease [*Gloeosporium nervisequum*] of *Platanus* in the Bodensee region.]** *Pflanzenschutz, München* 3 (9), 1951 (109–11). [G.] L.S.

45. DAMAGE BY ANIMALS

451. *Mammals*

See also Nos. 3027, 3183, 3332, 3399, 3456, 3513–4.

3500. CURTIS, J. D., and WILSON, A. K. **Porcupine feeding on Ponderosa Pine in central Idaho.** *J. For.* 51 (5), 1953 (339–41). 8 refs.

Analysis of data collected from pole-stage Ponderosa Pine stands indicated a preference by porcupines for feeding on trees of 8- to 10-in. diameter, and in dense rather than sparse stands. Suggested remedies are thinning of over-dense stands, and pruning of trees malformed as a result of attack.

3501. GERSDORF, E. Vorläufige Mitteilung über die Annahme von Köderhölzern durch die Erdmaus (*Microtus agrestis*). **[Preliminary report on the acceptance of poisoned wood by *M. agrestis*.]** *Anz. Schädlingsk.* 26 (3), 1953 (40–1). 2 refs. [G.]

To find species most readily attacked by *M. agrestis* and therefore suitable for traps, 30-cm. twigs from 18 different species were piled in the forest, some twigs in each heap being treated with Cumarax paste, 4% lead arsenate solution or 1% Borchers P.O.X. solution. The results showed that the treated twigs were as readily taken as the untreated. A table shows to what degree the species (treated and untreated) were readily taken by the mice.

3502. HOOVEN, E. F. **Some experiments in baiting forest lands for the control of small seed eating mammals.** *Res. Bull. Ore. Bd. For.* No. 8, 1953. pp. 69. 12 refs.

A fuller report on experiments already published. [Cf. *For. Abstr.* 14 (Nos. 456–7).]

3503. SCHUBERT, G. H. **A trial of three chemicals as rodent repellents in direct seeding.** *For. Res. Note Calif. For. Range Exp. Sta.* No. 84, 1953. pp. 2. 1 ref.

In direct sowing tests with *Pinus lambertiana*, Na fluoroacetate, red lead and Zn phosphate in different carriers, applied as a paste to the seed, were all ineffective as repellents. Results showing stocking on screened and unscreened plots (averages of 88 and 2% respectively at the end of the first year) are tabulated. There was no evidence that the chemicals either repressed or aided germination.

3504. **Hints on controlling grey squirrels.** Forestry Commission, London. 1953. pp. 4.

An information leaflet. [Cf. *For. Abstr.* 14 (No. 3027).]

3505. KOLEHMAINEN, V. A. Oravat lehtikuusen kimpussa. **[Squirrel attacks on Larch.]** *Metsät. Aikak.* 1953 (1), (15). [Fi.]

A stand of Siberian Larch was damaged by squirrels removing strips of bark in spring. Eaten patches alternated with untouched ones where the squirrels had sat on the branches. The barked strips were 1·5–2·5 m. from the crown, 2–4 m. long and 2–10·5 cm. broad. The sample area investigated covered 20 ares; 36% of the trees were stripped, mostly those of 11–19 cm. d.b.h. In the neighbouring [European?] Larch stands, covering 80 ha., scarcely any trees had been damaged.

3506. GOBIET, M. Dégâts d'écureuils dans les pineraies. **[Squirrel damage in Pine woods.]** *Bull. Soc. for. Belg.* 60 (3), 1953 (164–6). [F.]

A note on damage to bark of Pine trees in Belgium. It was observed that small quantities of Corsican Pine introduced into Scots Pine stands were not touched, apparently because of the thickness of their bark.

3507. SCHUBERT, G. H. **Ponderosa Pine cone cutting by squirrels.** *J. For.* 51 (3), 1953 (202).

Squirrels (mainly *Tamiasciurus* spp.) have been found to destroy as much as 93% of the cone crop of *Pinus ponderosa.*

3508. MCQUILKIN, W. E., and LITTLE, S. **Deer repellent fails to protect Pine seedlings.** *Ntheast. Res. Note Ntheast. For. Exp. Sta.* No. 15, 1952. pp. 4.

A commercial preparation with a Zn-dithiocarbamate-amine complex plus polyethylene polysulphide as its active ingredients, was tested on Pine species in New Jersey and Pennsylvania. In the New Jersey tests there was a slight but scarcely significant difference in deer browsing on treated and untreated trees; in Pennsylvania none. [Cf. *For. Abstr.* 13 (No. 450).]

3509. **Grazing damage to planted Pines.** *Rep. Sth. For. Exp. Sta. 1952* [1953?] (67–8).

Between March and July 1952, pigs killed, by girdling or stripping the bark from the main stem and upper root near ground level, an average of 472 Loblolly Pine seedlings, planted in 1949–50, and damaged 90 more, per acre. Only 195 seedlings/acre were left undamaged. A survey in a mixed planting showed that pigs girdled and killed 52% of the Slash but less than 4% of the Loblolly Pine. In a controlled study, a total of 3025 Longleaf and 2422 Slash Pine seedlings (planted in 1950–52) were available between March and July 1952, to 4 woods pigs fenced in on the 12-acre study area. In about 1 month the pigs destroyed 80% of the Longleaf and less than 1% of the Slash Pines. None of the following repellents, Good-Rite ZIP, creosote, Rosin Amine-D Acetate and Forestasan, kept pigs away. An electric fence with two charged wires 10 and 19 in. from the ground was also ineffective.

452. *Birds*

See Nos. 3513–4.

453. *Insects*

See also Nos. 3017–21, 3052–4, 3064, 3194, 3295–6, 3458, 3893.

3510. Elton, E. T. G., and Blankwaardt, H. F. H. Overzicht der beschikbare gegevens over insectenplagen in onze bossen en andere houtopstanden in het jaar 1951. [**Review of available data on insect pests in Dutch forests and other woody growth in 1951.**] *Ned. Boschb.-Tijdschr.* 25 (1), 1953 (3–15). 8 refs. [Du.du.e.] Also as *Meded. Com. Insectenplag. Bos.* No. 23.

Cf. *For. Abstr.* 13 (No. 1359).

3511. Brower, A. E. **Forest insect survey of Maine.** *J. econ. Ent.* 46 (2), 1953 (363–4).

A brief review of the organization and methods used in the survey.

3512. Schread, J. C. **Boxwood pests and their control.** *Bull. Conn. agric. Exp. Sta.* No. 565, 1953. pp. 12. 4 refs.

3513. Kolubajiv, S., and Kudler, J. Škůdci a choroby žaludů a obrana proti nim. [**Pests and diseases of acorns and their control.**] *Lesn. Práce* 31 (9), 1952 (388–92). [Cz.]

Besides birds [*Garrulus glandarius*, *Loxia curvirostra*, *Columba* spp.), pests of acorns on trees in Czechoslovakia include: *Balaninus glandium*, *B. venosus*, *B. nucum*, *Carpocapsa splendana*, *C. amplana*, *Cynips quercus*, *C. caput-medusae*, *Callirhytis glandium*, *Andricus* spp., *Neuroterus glandium*. When stored, acorns suffer from house and field mice, as well as from the fungi *Sclerotinia pseudotuberosa*, *Botrytis cinerea*, *Phomopsis quercella*, *Penicillium turbatum*, *P. corymbiforme*, *P. divergens*, *Trichothecium roseum*, *Gloesporium quercinum*, *Schizophyllum alneum*, *S. commune*, *Stereum hirsutum*. The enemies of sown acorns are the birds and rodents mentioned above, and pheasants; next wireworms; and, finally, *Fusarium* and *Cytospora*. Nature of damage and control measures are given.

3514. Patočka, J., and Turček, F. O málo známých škůdcích jilmového semene. [**Little-known pests of Elm seeds.**] *Lesn. Práce* 32 (3), 1953 (123–7). [Slovak.]

Describes in some detail the following: (*a*) larvae: *Scopelosoma satellitia* and *Orthosia circellaris*; (*b*) birds and mammals: *Chloris chloris*, *Carduelis carduelis*, *Apodemus flavicollis*. [Cf. *For. Abstr.* 10 (No. 2290).]

3515. **Insect pests of *Casuarina equisetifolia*.** *For. Res. India 1948/49, Part 1* 1952 (52–3).

Investigation of *Gymnogryllus humeralis*, a pest of Casuarina seedlings, showed that it did not attack plants 20 in. high and over. It feeds on grass and other rank vegetation growing in or near Casuarina seedlings, and apparently turns to the Casuarina seedlings when other food is not available. It is considered possible that the clean weeding of nursery beds promotes the attack, and partial weeding is suggested as a remedy.

Other insects damaging Casuarina are *Antheraea paphia*, *Ascotis* sp., *Clania* spp., *Eumenodera tetrachorda*, and *Lymantria* sp.

3516. MacLeod, D. M. **The virulence of the parasitic fungi, *Beauveria* spp.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 9 (1), 1953 (2).

Under laboratory conditions, a heavy mortality generally develops within 6–10 days when spores of *Beauveria bassiana* are sprayed or dusted on larvae of *Pristiphora erichsonii*, *Cacoecia fumiferana*, *Carpocapsa pomonella*, *Malacosoma disstria* and *Diprion hercyniae*. Under field conditions, however, the artificial dissemination of spores on feeding *P. erichsonii* larvae did not cause a significant increase in the incidence of *Beauveria* infection. More promising results were obtained when the spores were applied as a ground spray just before the larvae dropped to the ground to form cocoons.

3517. Vité, J.-P. Untersuchungen über die ökologische und forstliche Bedeutung der Spinnen im Walde. [**The ecological and silvicultural significance of spiders in the forest.**] *Z. angew. Ent.* 34 (3), 1953 (313–34). 60 refs. [G.g.] O.H.

Surveys types of spider and the rôle they play in forest ecology, their feeding habits, and factors affecting populations. Of 840 central European species 425 live for preference in the forest, where, as predators of forest insects and/or parasites, they may influence profoundly the forest biocoenosis. Population densities depend on the forest type. The highest are found in stands most closely resembling virgin forest; mixed stands have higher populations than pure stands, and deciduous stands than conifer stands, especially Pine. Species and population densities of forest margins differ from those of the stand interior, and may form a protective barrier against insects attempting to enter the stand. The earth- and litter-inhabiting species have little significance for the forester. Those inhabiting the vegetation, however, exercise a definite influence upon populations of the smaller defoliators and sap-sucking insects and on their parasites and predators.

3518. Gösswald, K. Die rote Waldameise im Dienste der Waldhygiene—forstwirtschaftliche Bedeutung, Nutzung, Lebensweise, Zucht, Vermehrung und Schutz. [**The red ant in the service of the forest—significance for forestry, uses, life history, breeding, propagation and protection.**] Metta Kinau Verlag, Wolf ü. Täuber, Lüneburg. [1951] pp. 160 + 7 plates. 72 refs. [G.] I.I.E.

3519. Wellenstein, G. Zur Ernährungsbiologie der roten Waldameise (*Formica rufa* L.). [**The food of *F. rufa*.**] *Z. PflKrankh.* 59 (11/12), 1952 (430–51). 50 refs. [G.e.] I.I.E.

Summarizes the results of studies over 25 years on the relationship between *F. rufa* and Aphididae, Coccidae and Psyllidae as sources of food. Concludes from observations from spring to autumn that one nest of average size (6 m. circumference, 60 cm. height) gathers during a year: 8 million insects, 400,000 of which are harmful to the forest; 200 litres carbohydrate, predominantly plant-louse

sugar; and 40,000–60,000 seeds. The normal hunting ground for such a nest is 0·5 ha., but during a mass increase of caterpillars it shrinks to 0·1 to 0·3 ha.

3520. Hahn, S. Unerwünschte Nebenwirkungen der biologischen und chemischen Schädlingsbekämpfung in Land- und Forstwirtschaft. **[Undesirable side-effects of biological and chemical pest control in agriculture and forestry.]** *Schädlingsbekämpfung, Staufen im Breisgau* 43 (1), 1951 (7–11). 47 refs. [G.g.] I.I.E.

In Queensland, stock (sheep in particular) die as a result of eating sawfly larvae (*Tenthredinidae*). Eating of larvae of *Thaumetopoea processionea*, *T. pityocampa*, and *T. pinivora* causes stomatitis in horses. *Malacosoma castrensis* often causes diseases of cattle. Many beetles and aphids are also poisonous to mammals.

Undesirable effects of chemical pest control are multifarious. Sometimes, the parasite of the pest is more sensitive to insecticides than the host insect (e.g. *Acantholyda nemoralis* which is parasitized by robber flies and parasitic Hymenoptera); all known insecticides are more or less poisonous to bees. Birds are relatively immune to insecticides.

3521. Richter, G. Die Auswirkung von Insektiziden auf die terricole Makrofauna. (Quantitative Untersuchungen begifteter und unbegifteter Waldböden.) **[The effects of insecticides on the soil macrofauna. (Quantitative investigations in treated and untreated forest soils.)]** *NachrBl. dtsch. PflSchDienst* 33 (4), 1953 (61–72). 38 refs. [G.g.] [Deutsche Akademie der Landwirtschaftswissenschaften zu Berlin, Biologische Zentralanstalt Kleinmachnow.]

Plots were treated by (1) dusting alone with BHC powders, or dusting and digging in BHC powders (240 g. of γ BHC/are); (2) spraying with commercial sprays (0·2% Wofatox, 0·2% Hexitol and 2% Ruscalin) at rates of 20 litres and 10 litres/sq. m.; (3) spraying with 2% Ektolit-Extra 20 (DDT-emulsion) at 10 litres/sq.m.; (4) raking in dust containing 10% DDT (200 kg./are; and (5) raking in BHC powder at a rate of 3000 g. of γ BHC/are. Treatment of insects living on the soil surface does not appear to disturb the biological equilibrium. Treatment of pests living in the soil, particularly the older stages of *Melolontha melolontha*, has a marked and lastingly adverse effect on the soil fauna, particularly on Collembola and Acarina. Control of such pests as *M. melolontha* should therefore take place during the early stages, using light dosages of insecticide. Applications of γ BHC at less than 100 g./ are seem to cause no great harm. Oligochaeta are resistant to the insecticides. BHC incorporated into the soil on humous, sandy sites kept its full potency 2 years after treatment.

3522. Bröker, W. Prüfung der Beständigkeit von Dichlor-diphenyl-trichloräthan und Hexachlorcyclohexan mit Hilfe einer chemisch-analytischen Methode. **[A test of the residual effects of DDT and BHC with the help of chemical analysis.]** *Anz. Schädlingsk.* 26 (3), 1953 (38–9). 6 refs. [G.g.]

Tests of the residual effects on flower buds of Apple and Pear showed that the insecticides do not penetrate into the interior of the bud, and although the buds remain dangerous to bees the first day after spraying, in normal weather the danger ceases 2–3 days after treatment.

Hemiptera

3523. Plumb, G. H. **The formation and development of the Norway Spruce gall caused by *Adelges abietis*.** *Bull. Conn. agric. Exp. Sta.* No. 566, 1953. pp. 77 + 40 photos. 243 refs.

The morphology of the dormant bud and developing shoot of Norway Spruce has been studied; and the derivation of certain tissues from their precursors has been established. This work has also shown that the gall caused on this Spruce by *A. abietis* is formed from cortical cells of the stem and leaf-stalklet, not from the cells of the leaf itself as generally supposed. Differentiation of the intercalary meristem and abscission layer in the needle is either completely inhibited, or is affected not at all. The epidermal cells that line the gall chambers are unaltered. The external form of the gall may be due to the stresses enforced by the position of the tissues affected.

The successful overwintering of the fundatrix nymph at the base of the bud may be due to a higher content of possible food materials in the bud, since the two-year stem contains comparatively little of these. The fact that starch accumulates in the gall cells during its growth may indicate that it and its derivatives are not primary nutrients of the gallicolae. The disappearance of starch on maturing of the gall may be due to its transformation into lignin, since the desiccated gall is completely lignified. No discrete nutritive zone such as is found in many cynipid galls occurs. The gallicolae feed in the first few rows of cells surrounding the gall chambers.

Extracts of the salivary glands, injected into normal buds of Spruce in the spring just at the time of swelling, caused the initiation of gall formation in five buds. The transfer of gallicolae-producing eggs to the injected buds carried gall formation to completion in one case. Certain enzymes were detected in the salivary glands. Enzymes of the same type are present in the saliva of plant-feeding insects that do not form galls, however. The failure to find an amylase in the salivary glands of the fundatrix may have been due to faulty technique. But the absence of this enzyme, if actual, may carry over into the gallicolae; and this would aid in explaining starch accumulation in the gall.

A test for auxin, by means of the etiolated pea-stem technique, was negative. This may have been due to the use of an insufficient number of glands. It is not believed, however, that auxins play any part in the formation of this gall. Indole-acetic and indole-butyric acids failed to cause a growth stimulus in the bud similar to that caused by the fundatrix. Folic acid injected into young galls failed to inhibit further development at the concentration used.

Fumigation experiments failed to show that maturing of the gallicolae, hence cessation of feeding, is necessarily correlated with maturing of the gall and opening of the pockets. *Author's summary.*

3524. Bray, D. F. **Life history and control of *Cinara winonkae*.** *J. econ. Ent.* 46 (1), 1953 (103–7). 14 refs.

Poor growth and dying of *Thuja orientalis*, particularly of the variety *aurea nana* in Delaware, was found to be due to attack by this aphid. Control of aphids on the roots can be obtained by disking chlordane into the soil at a rate of 5 lb./acre before planting, or by injecting a spray of chlordane into the soil round the roots. On the foliar portions a spray of 15% parathion or BHC (6%γ) may be applied at 2 and 4 lb./100 gal. water, respectively.

3525. Stewart, K. E., Finnegan, R. J., and Kirby, C. S. **Control of Fletcher scale, *Lecanium fletcheri* Ckll., on Japanese Yew [*Taxus cuspidata*].** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 9 (2), 1953 (3).

Spraying with parathion gave 100% control; nicotine sulphate + summer spray oil, 92·3%; and malathon, 87·5%.

3526. Pesante, A. Sopra una forma di associazione tra licheni e cocciniglie. [**A form of association between lichens and scale-insects.**] *Ann. Sper. agr.* 7 (1), 1953 (63–72). 6 refs. [It.] C.G.B.

Describes parasitism of *Xanthoria parietina* on several species of *Diaspis* and *Quadraspidiotus* on Apple, Lime, Olive and Walnut trees.

3527. Brown, C. E. **Coccinellid predators of scale insects [*Lecanium corni*].** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 9 (1), 1953 (3).

Lepidoptera

See also Nos. 3017–8.

3528. Schwerdtfeger, F. Untersuchungen über den 'eisernen Bestand' von Kiefernspanner (*Bupalus piniarius* L.), Forleule (*Panolis flammea* Schiff.) und Kiefernschwärmer (*Hyloicus pinastri* L.). [**Investigations into the 'natural population level' of *B. piniarius, P. flammea* and *H. pinastri*.**] *Z. angew. Ent.* 34 (2), 1952 (216–83). 41 refs. [G.g.] O.H.

Presents the results of population studies made over a period of 11 years. Data were assembled on the following: % of ♀s in the pupal and adult stages; extent of parasite attack in both sexes; the influence of ♀ numbers on population trends; weights of pupae and their relation to egg production; weights of diseased and parasitized pupae; % of emergence of adults and factors influencing it; parasites, their habits, life history and influence on populations; times of adult emergence and the influence of temperatures on them; the influence of weather on population densities; mortality in prepupal and pupal stages. The distribution of sexes in *B. piniarius* is affected by weather and, in a small measure, by parasitization. In *P. flammea*, weight of the pupae and production of eggs were limited by the weather, which appeared to control feeding. In no case was any factor of importance in isolation, but only as one of a chain of circumstances. The significance of these findings is discussed. [Cf. *For. Abstr.* 4 (132).]

3529. Brian, M. V., and Brian, A. D. **Bird predation of defoliating caterpillars.** *Scottish Naturalist, Edinburgh* 62 (2), 1950 (88–92). 2 refs. O.R.S.

Ten wire-netting cages were established, each holding about 400 leaves, on an Oak tree N. of the Forth of Clyde in early April 1949. Two months later the number of caterpillars inside the cages was found to be 63 (18 larvae of *Operophtera brumata*, 14 larvae and 9 pupae of *Tortrix viridana*, 18 larvae of other Lepidoptera and 4 sawfly larvae) and those on control branches only 17. Chaffinches seemed to be the principal caterpillar eaters.

3530. Walters, J. **Pitch moth infestation in Western White Pine [*Pinus monticola*].** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 9 (1), 1953 (3–4).

Investigation of an infested stand showed that two species (tentatively identified as *Dioryctria zimmermanni* and *Vespamima novaroensis*) were present in large numbers. They usually attacked trees suffering from blister rust in the first place, until populations built up to epidemic proportions and healthy trees were attacked.

3531. Neugebauer, W. O. Das Problem der Indifferenz von Forstinsekten, unter besonderer Berücksichtigung der Ökologie des Kieferntriebwicklers. [**'Indifference' in forest insects, with special reference to the ecology of *Rhyacionia buoliana*.**] *Verhandlungen der Deutschen Gesellschaft für Angewandte Entomologie 1949, Berlin* 1951 (103–10). 6 refs. [G.] I.I.E.

Discusses the effect of parasites, food and climate on size of insect populations and gives diagrams illustrating the relationship between potential and effective range, distribution of food plants, climatic optimum and area of mass outbreaks for *Cacoecia histrionana, C. murinana, Epiblema tedella, Tortrix viridana, Panolis flammea* and *Rhyacionia buoliana*. The factors encouraging mass outbreaks of *R. buoliana* (low rainfall during the year or growing season, poor resistance of trees on cold sites because of low resin production, and inadequate water supply) are discussed, with possible methods of preventing outbreaks by building up stands of resistant Pine species and provenances, improving the water economy of the stand, and continuous control in threatened stands throughout years when no serious attack takes place, so as to reduce population density.

3532. Vojtuň, A. *Evetria posticana* Zett—vážny škodca kosodreviny vo V. Tatrách. [***E. posticana*, an important pest of *Pinus mugo* in the High Tatra mountains.**] *Pol'ana* 8 (7/8), 1952 (137). [Slovak.]

Reports the first appearance of *E. posticana* in Slovakia; ca. 20% of buds of *P. mugo* were destroyed by the insect in spring 1951.

3533. Acatay, A. Sedir ağaçlarına musallat olan *Acalla undulana* Wisghm. [***A. undulana* as a pest of *Cedrus libani* [in S. Anatolia].**] *Istanbul Üniv. Orm. Fak. Derg.* 2*A* (1), 1952 (83–7 + 5 photos + 1 map). [Turk.g.]

Discusses the biology of the insect and its occurrence in Turkey.

3534. Dowden, P. B., Jaynes, H. A., and Carolin, V. M. **The role of birds in a Spruce budworm outbreak in Maine.** *J. econ. Ent.* 46 (2), 1953 (307–12). 7 refs.

Studies were made on three areas in Maine. On two areas birds were undisturbed, and on the other an attempt was made to shoot all birds found during the period when they normally feed on the Spruce budworm (*Cacoecia fumiferana*). It was impossible to obtain reliable figures by the methods used, but the indications are that birds consumed 100–300 budworms per tree on one of the areas. [Cf. *For. Abstr.* 13 (No. 4032).]

3535. Daviault, L. **Application of DDT to control the Spruce budworm.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 9 (1), 1953 (1–2).

In the Caseault forest reserve, comparison was made of two methods of sampling larval mortality after spraying: (1) by sampling populations on 18-in. twigs cut from sample trees, and (2) by daily counts of larvae falling on a collecting sheet below sample trees. Method (1) gave 99·3% and method (2) 97·2% mortality. No consistent relationship was found between amount of spray reaching the ground and larval mortality.

3536. Webb, F. E. **Larval mortality following Spruce budworm spraying.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 9 (1), 1953 (1).

Mortality of Spruce budworm larvae following aerial spraying [insecticide not specified but probably DDT] was assessed by daily counts of larvae falling on cloth trays of specific dimensions placed beneath sample trees. Rate of drop was highest during the first day following spraying, continued high the second day and fell off rapidly thereafter; 85% of the drop occurred within 3 days and 98% within a week. Most of the sprayed area received more than one spray application, owing to drift, and it has been suggested that an equal kill could be obtained by doubling the distance between flight lines and spraying the area twice. This would have the advantage of completing the first application in time to protect the new foliage.

3537. Belyea, R. M. **Death and deterioration of Balsam Fir weakened by Spruce budworm defoliation in Ontario. Part I. Notes on the seasonal history and habits of insects breeding in severely weakened and dead trees.** *Repr.* from *Canad. Ent.* 84 (11), 1952 (325–35). 10 refs.

Deals with 7 species of Coleoptera.

3538. Turner, K. B. **The relation of mortality of Balsam Fir (*Abies balsamea* (L.) Mill.), caused by the Spruce budworm (*Choristoneura fumiferana* Clem.), to forest composition in the Algoma Forest of Ontario.** *Publ. Dep. Agric. Can.* No. 875, 1952. pp. 107. 39 refs.

The investigation was restricted to areas where the mortality of Balsam Fir was moderately high (ca. 75%). The first part deals with the effect on Fir mortality of individual variables—total age of Fir, topography, basal area/acre of Fir, its % in the crop and its relative height or crown class, b.a. of *Picea glauca* and b.a./acre of the whole stand. The b.a. of Fir appeared to be important, % mortality of this species usually increasing with its representation. In most cases Fir mortality increased with relative height of Fir.

In the second part of the analysis, where important variables were held under control, it was found that greatest mortality of Fir occurred in cover types where the conifers were mainly Fir/Spruce or Pine; damage to Fir was less where, among the conifers, Cedar [*Thuja occidentalis*] or a mixture of species predominated. The influence of increasing proportions of hardwoods was variable, depending on the relative height of the Fir. When the Fir was in the intermediate height class, Fir mortality decreased with increasing proportions of hardwoods; when Fir was in the understorey, Fir mortality tended to increase with increasing proportions of hardwoods; and when Fir was co-dominant, its mortality was unaffected by the proportion of hardwoods. *From author's abstract.*

3539. Kabe, M. **[Studies on the Peach pyralid moth *Dichocrocis punctiferalis*, infesting Fir in Tochigi prefecture.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 60, 1953 (71–80). 13 refs. [Jap.e.]

Serious damage was caused to *Abies firma* in 1949–51. The biology of *D. punctiferalis* is discussed. DDT spray and a blue fluorescent light trap proved successful in controlling adults.

3540. Schuder, D. L. **The bagworm in Indiana.** *Proc. Indiana Acad. Sci.* 61, 1951 (1952), (159–64). 4 refs. A.P.B.

Life history and results of experiments in the control of *Thyridopteryx ephemeraeformis*, one of the most important pests of ornamental trees and shrubs in Indiana. The pest is effectively controlled by toxaphene and the synthetic organic phosphate insecticides—Metacide, parathion, Systox and Patasan, even when the larvae are nearly mature. All except toxaphene, however, are too toxic for the average layman to apply. Pb arsenate is safe and effective, but must be used before the larvae are half-grown.

3541. Butcher, J. W., and Hodson, A. C. **Field comparisons of endrin, dieldrin, DDT and toxaphene for control of the forest tent caterpillar.** *Minn. For. Note* No. 16, 1953. pp. 2.

Excellent control was given by spraying with all the chemicals tested, at rates varying from 0·15 to 1·50 lb./acre. Toxaphene acted slowest.

3542. Groschke, F. *Boarmia bistortata* Goeze, der Heidelbeerspanner, ein neuer Grossschädling. **[*B. bistortata*, a new pest of importance.]** *Verhandlungen der Deutschen Gesellschaft für Angewandte Entomologie 1949, Berlin* 1951 (120–4). [G.] I.I.E.

In 1948 a mass outbreak of *B. bistortata* stripped *Vaccinium myrtillus* of leaves, buds and green bark from the branches throughout an area of 2000 ha. and seriously defoliated small Pine and Spruce, and to a less extent larger trees, in the same area. The biology of the insect is discussed. Laboratory feeding experiments showed that old needles were unsuitable for food, a large proportion of larvae

dying when no other food was available. Development was delayed by several days in larvae fed exclusively on young Spruce or Raspberry rather than on Bilberry shoots. The financial loss by the loss of the Bilberry crops is estimated at DM.2·5 millions. Dusting with DDT in late May or early June is suggested as a control method.

3543. Hašek, J. Drsnokřídlec modřínový—*Poecilopsis isabellae* Harr.—původce žíru na modřínech v pěstbebním středisku Račice. [***P. isabellae* damages Larch in the Račice forest enterprise.**] *Lesn. Práce* 31 (8), 1952 (371–3). [Cz.]

Larch forming an overstorey to Hornbeam, Beech and Oak was seriously defoliated (40–50% of the crown), the attack culminating in July, 1951.

3544. [**Hawk-moth damage to *Rauwolfia natalensis*.**] *Rep. For. Dep. Nyasald. 1951*, 1952 (9).

At Lilongwa some 2-year-old stands of *R. natalensis* were defoliated by a large hawk-moth caterpillar (unidentified). The trees appear to recover well, but their general growth must be adversely affected. *R. natalensis* interplanted in alternate lines with *Gmelina arborea* was not attacked.

3545. Um grave perigo para a agricultura nacional—*Hyphantria cunea* Drury. [**A serious menace to national agriculture—*H. cunea*.**] *Conselhos para a Defesa Sanitária das Culturas, Direcção Geral dos Serviços Agrícolas, Ministerio da Economia, Lisboa* No. 4, 1952. pp. [7]. [Port.]

Notes on the pest, its introduction into Europe and its spread, and the necessity for guarding against its entry into Portugal.

3546. Kobendza, R. Różnopostaciowość liści dębu szypułkowego (*Quercus robur* L.) pod wpływem uszkodzeń owadzich. [**Heteromorphism of the leaves of *Q. robur*, due to insect damage by *Euproctis chrysorrhoea*.**] *Roczn. dendrol. polsk. Tow. bot., Warsz.* 8, 1952 (201–5). [Pol.russ.e.]

3547. Naude, T. J. **Annual report for the Department of Agriculture [South Africa] for the year ended 31 August 1952. Entomological services and research.** *Fmg. S. Afr.* 27 (321), 1952 (616–21). E.M.B.

Work on forest pests has included studies of *Euproctis terminalis* which reveal that the larval stage in Pretoria takes a minimum of 160 days; at Jessievale, where temperatures are lower, it lasts as long as 240 days. In some seasons as many as 94% of the larvae perish from disease. In seasons of high summer rainfall 74% of the pupae die from the fungus *Isapia farinosa*. *Nudaurelia cytherea* is well under control in the western Cape Province, but has appeared at 6 centres in the Transvaal, attacking several species of Pine and *Eucalyptus paniculata* as well as a variety of wild hosts. [Cf. *For. Abstr.* 11 (No. 723).]

3548. Holbrook, R. F. **Gypsy moth sex attractant from Europe for use in trapping program.** *J. econ. Ent.* 46 (2), 1953 (355–7).

Report on a visit to Europe to locate an area suitable for collecting and rearing *Lymantria dispar* in order to obtain sex attractant in quantity (infestation being at a low ebb in New England), and of work finally achieved in Portugal.

3549. Acree, F., Jr. **The isolation of gyptol, the sex attractant of the female gypsy moth [*Lymantria dispar*].** *J. econ. Ent.* 46 (2), 1953 (313–5). 9 refs.

Cf. *For. Abstr.* 11 (No. 1709).

3550. Kruel, W. Das Schadauftreten der Nonne im ostdeutschen Kieferngebiete 1947–50. [**Outbreak of the nun moth in the East German Pine region, 1947–50.**] *Verhandlungen der Deutschen Gesellschaft für Angewandte Entomologie 1949, Berlin* 1951 (157–71). 23 refs. [G.g.] I.I.E.

The development of the outbreak, parasites, and control by spraying from the air. [Cf. *For. Abstr.* 13 (No. 1785).]

3551. Erdem, R. Türkiyedeki çam keseböceği mücadelesine esas teşkil etmek üzere temas zehirlerinin (*Thaumetopoea pinivora*) tırtılları üzerindeki tesirine ait araştırmalar. [**Investigations on the effect of contact poisons on *T. pinivora* larvae as a basis for control of processionary caterpillars in Turkey.**] *Tar. Bak. Orm. gen. Müd. Yay.* No. 81, 1949. pp. 58. 45 refs. [Turk.turk.]

Work done by the author in Germany in 1939 and not so far published in Turkish.

Coleoptera

See also Nos. 3019–21, 3194, 3456, 3537, 3580, 3619.

3552. Bytinski-Salz, H. **Two important tree borers [*Batocera rufomaculata* on Figs and *Phoracantha semipunctata* on *Eucalyptus*] in Israel.** *FAO Plant Prot. Bull.* 1 (3), 1952 (38–9). I.M.I.

An account of their biology, distribution and status in Israel, with recommendations for control.

3553. Gardner, J. C. M. ***Oemida gahani* Distant.** *Rep. E. Afr. Agric. For. Res. Organ. 1952* [1953] (60).

This cerambycid beetle is a serious pest of exotic conifers (chiefly *Cupressus* spp.) in Kenya. It is essentially a dead-wood borer, but can breed in the centre of living stems of exotic conifers, if given access through areas of dead wood on the outer surface. Such areas may be provided by pruning scars or by wounds made by animals. There appears to be no reliable means of discovering whether a living tree is attacked but, on felling and sawing, as many as 80% of *Cupressus* trees have proved to be riddled with larval galleries. It is almost certain that attack would become negligible if pruning were abolished. Possible improvements in pruning technique and treatment of pruning wounds are being investigated.

3554. Wettstein, O. Über eine Zucht von *Tetropium fuscum*. [**A population of *T. fuscum* bred out [from a dead Norway Spruce log].**] *Mitt. forstl. VersAnst., Mariabrunn* No. 47, 1951 (42–69). 7 refs.

Notes on this and other insects bred in the laboratory in 1950 from a log sawn out of a 170-year-old Spruce that had died two years previously

from unknown causes. Over 1200 adults of *T. fuscum* emerged from samples having a total bark area of 1·85 sq. m., and the population for the entire bole is estimated at 31,000. From the observed sex ratio (3♂s : 2♀s) it is probable that *T. fuscum* first attacked the tree in 1948, when it was already ailing, and that two generations had been completed by 1950. Some points in the biology of the beetle are discussed on the basis of the author's observations. Other arthropods bred out from or found on the samples included parasites of *T. fuscum*; other beetles (chiefly *Ips typographus*, *Polygraphus polygraphus*, *Serropalpus barbatus*, *Anobium emarginatum*), *Sirex juvencus*, and their parasites; and miscellaneous insects, spiders, mites etc. A complete list is given, and the biology of the more important species is briefly discussed.

3555. Joly, R. Les insectes de l'écorce et de l'aubier. **[Bark and sapwood insects.]** *Rev. Bois Appl.* 8 (3), 1953 (12–5). [F.]

Brief illustrated descriptions of *Clytus arcuatus*, *C. arietis*, *C. detritus*, *Callidium sanguineum*, *C. variabile*, *Rhagium sycophanta*, *Chrysobothris* sp., *Coraebus undatus*, *Tetropium* spp., *Acanthocinus aedilis*, *Pissodes pini*, *P. notatus*, *P. piceae*, and *Dioryctria splendidella*.

3556. Tooke, F. G. C. **History of *Eucalyptus* snout-beetle control.** *Fmg. S. Afr.* 28 (324), 1953 (100–2). E.M.B.

Life history of *Gonipterus scutellatus*, and history of its control in South Africa, with particular reference to biological control.

3557. Schwerdtfeger, F. Praktische Erfahrungen bei der Rüsselkafer-Bekämpfung. **[Practical experience in the control of *Hylobius abietis*.]** *Holz-Zbl.* 77 (29), 1951 (345–7). 3 refs. [G.]

Critical description of various methods applied in NW. Germany in 1950. Preventive spraying with high % DDT solutions or with BHC emulsions gave best results.

3558. Schindler, U. Können niedrige Temperaturen den Erfolg der Schutzspritzung gegen den grossen braunen Rüsselkäfer (*Hylobius abietis* L.) beeinflussen? **[Can low temperatures influence the results of spraying to control *H. abietis*?]** *Forst u. Holz* 8 (9), 1953 (124–7). 11 refs. [G.g.] [Niedersächsische Forstliche Versuchsanstalt in Sieber/Harz.]

Laboratory experiments with insecticides commonly used to control *H. abietis* revealed that they are less effective at temperatures below 10° C., partly because movement and feeding by the insects is restricted, and partly because the preparations themselves are less potent at lower temperatures. Activity of *H. abietis* is so reduced at temperatures below 10°, that feeding to any considerable extent will only take place if the cool period is prolonged. This, however, rarely occurs at the time of emergence save at fairly high altitudes.

3559. Adrien-Robert, Fr. **Research on insects of the Elm.** *Rep. Dep. Lds. For. Quebec 1950/51*, 1952 (141–6 + 2 gphs.).

Summarizes observations on the native Elm bark-beetle (*Hylurgopinus rufipes*), the Elm weevils (*Magdalis* spp.), and several borers, varying insect populations at different levels on a young Elm, and experiments in the transmission of Dutch Elm disease by barkbeetles and weevils.

3560. Schüler, E. Neues Verfahren zur Borkenkäferbekämpfung—das Saftstromverfahren. **[New method of barkbeetle control—the osmosis method.]** *Forst u. Holz* 8 (8), 1953 (114–6). [G.]

Trials were begun in 1947 on the impregnation of standing trees for barkbeetle control by the Schmittutz osmosis process. Trees were ring-barked at breast height, making a girdle 50 cm. wide, and 'Osmolit U' was applied to the exposed surface. After 4 weeks nearly all the barkbeetles were dead. Various trials have been made with different compounds. Only compounds penetrating into the sapwood are of any use. Those with an alkali-arsenate base were most successful, though the effects do not extend to the part of the tree below the girdle. The treatment may be applied at any time of the year, though the effects are quicker during sap flow and in warm weather. The preparation of trap trees by this method is discussed. The process also protects the wood from fungi and furniture-beetles etc., but against these advantages must be set the inconvenience of using a highly toxic preparation. Cost of treating one tree averaged DM.0·55–0·65. [Cf. *For. Abstr.* 14 (Nos. 509–10).]

3561. Schvester, D. Premiers essais, en laboratoire, de formules insecticides contre le xylebore disparate: *Xyleborus dispar* F. (Col. Scolytidae). **[Preliminary laboratory tests of insecticides against *X. dispar*.]** *Annales des Épiphyties, Paris* (*n.s.*) 3 (1), 1952 (1–9). L.S.

The tests gave the following results: the immediate effects of 2% BHC and 2% DDT on *X. dispar* are roughly the same, but those of DDT are more persistent. The addition of emulsified petroleum oils increases the persistence of the effects of DDT but decreases that of BHC.

3562. Iablokoff, A. Kh. Les plantations de pin sylvestre et la migration des xylophages. **[Plantations of *Pinus sylvestris* and the migration of Scolytidae.]** *Rev. for. franç.* 5 (5), 1953 (321–7). 3 refs. [F.]

Discusses the effect of artificial plantations in attracting from a distance (1) insect pests, and (2) predators of the pests, and illustrates the thesis by the Scolytidae, mostly of mountain origin, which are now found in Pine plantations in the forest of Fontainebleau, and their predators. The latter are usually heavier and slower-moving than their prey and take longer to build up populations.

3563. Clark, J. **Post-logging attack by borers and bark beetles on Jack Pine.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 9 (2), 1953 (1).

A residual stand of Jack Pine which had been cut for pulpwood over a period of 3 years, was found to be suffering from the combined attacks of *Monochamus* spp. and *Ips pini*. Populations are supposed to have built up in the accumulated slash and then attacked trees already weakened by exposure and a hot dry summer.

3564. Connola, D. P., Yops, C. J., Wilcox, J. A., and Collins, D. L. **Survey and control studies of beetles attacking windthrown trees in the Adirondacks.** *J. econ. Ent.* 46 (2), 1953 (249–54).

Study plots were established in a windthrown area of the Adirondack forests of New York state, which were damaged by a storm in 1950. Red Spruce [*Picea rubens*] in particular was affected. Spraying from helicopter or aeroplane produced no reduction in barkbeetle populations. Hand sprays, however, were more successful, and the best protection was obtained with the highest dosage used (i.e. 1%) of lindane. A general survey was also made, and a list is presented, of beetles found on windthrown trees in untreated areas, with comments on the increase and types of beetle populations.

3565. Jones, G. D., and Ford, J. E. **The turpentine beetle in North Carolina.** *Extension Folder, N.C. State College of Agriculture and Engineering, Raleigh* No. 91, 1952. pp. [4].

Short notes on *Dendroctonus valens* and *D. terebrans*, the damage they cause, and prevention and control measures.

3566. Schimitschek, E. Der Ernährungs- und Überwinterungsfrass des *Phloeosinus bicolor* Brull. (*Ph. aubei* Perris). **[Feeding and overwintering galleries of *P. bicolor*.]** *Mitt. forstl. VersAnst., Mariabrunn* No. 47, 1951 (101). [G.]

Illustrates a feeding gallery of *P. bicolor* in material sent from Turkey. The sender, A. Acatay, reports that this species overwinters in such galleries made in the axils of *Chamaecyparis*, *Cupressus* or *Juniperus* shoots.

3567. Nitto, M., and Tachibana, K. **[The range of attraction of fluorescent lamps for chafers.]** *J. Jap. For. Soc.* 34 (7), 1952 (223–7). [Jap.e.]

In a study of the use of fluorescent lamps for chafer control, made in the past 2 years at Sanmyoji nursery, a number of experiments were made in releasing marked beetles of 6 species. Results given in tables and a graph, with some English legends, include the following: (1) Highest recovery among the many species used was from *Anomala rufocuprea*. (2) Very few beetles were recovered from those released at distances of 160 m. or more from the source of light or from places where the lie of the ground hid the light. (3) The % recovery of beetles liberated in windbreaks was very low, and that of those liberated outside still lower. (4) Temperature, humidity, amount of cloud, phase of the moon, wind force and other weather conditions influenced the flying activity of the beetles. (5) Recovery decreased steadily with increasing distance of the point of release from the light. (6) Most of the beetles recovered were recovered within 30 min. *From authors' summary.*

Hymenoptera

3568. Schimitschek, E. Über die Polyederkrankheit der Fichtengespinstblattwespe *Lyda hypotrophica* Htg. (*Cephaleia abietis* L.). **[The polyhedral disease of *C. abietis*.]** *Mitt. forstl. VersAnst., Mariabrunn* No. 47, 1951 (70–3). 8 refs. [G.g.]

A new polyhedral disease discovered in 1948 among larvae in the soil during an outbreak of this pest in Burgenland, Austria. The polyhedra are large (2–19μ diam.) and very numerous, have a thick cortical layer in the final stage, and occur in the greatly enlarged nuclei of the fat tissue. From 1948 to 1951 mortality from the disease was low in natural conditions, though usually ca. 100% in larvae brought into the laboratory. This suggests that the virus is present in practically all larvae in nature, and that its artificial dissemination would not increase the incidence of the disease.

3569. Crooke, M. **Some notes on *Anoplonyx destructor* Benson.** *Bull. ent. Res.* 44 (1), 1953 (77–81 + 1 plate). 3 refs.

[Cf. *For. Abstr.* 14 (No. 1378).] Describes the life cycle of the insect, the larvae in their different instars, the distribution of the pest in Great Britain, type of damage caused, and present forest status. *A. destructor* is not currently a pest of any great importance in Britain. Some unsuccessful attempts have been made at biological control by releasing the parasite *Dahlbominus fuscipennis*.

3570. Joly, R. Les lophyres des pins. **[The Pine sawflies.]** *Rev. for. franç.* 5 (4), 1953 (269–72 + 2 photos). 1 ref. [F.]

Laboratory experiments were made to test the efficacy of a number of insecticides on the larvae of several species of *Diprion*. DDT was almost totally ineffective. Insecticides based on rotenone, pyrethrin, TTC (trithiocarbonate) or phosphoric esters gave rapid and effective results. BHC was slower but gave good results.

3571. Cantelo, W. W. **Birch leaf miner [*Fenusa pusilla*] and its control.** *Proc. nat. Shade Tree Conf.* 1952 (45–58).

Tests of a number of insecticidal sprays showed that lindane was best for combined effectiveness against the pest and non-toxicity to man, and needed only one spray to give good control.

3572. Thalenhorst, W. Vorzeitiger Zusammenbruch einer Massenvermehrung von *Gilpinia frutetorum* F. (Hym. Diprionidae). **[Premature collapse of an outbreak of *G. frutetorum*.]** *Anz. Schädlingsk.* 26 (4), 1953 (53–6). 8 refs. [G.]

During a study of an outbreak of *G. frutetorum* in the winter of 1951–2 in the Diepholz forest district (lower Saxony) it was noted that resin exudation had a definite inhibiting effect upon the emergence of larvae, and it is suggested that this may be responsible for the sudden collapse of the outbreak. Further to these inquiries, statistics were examined relating to temperatures and rainfall in Schwerin, Celle, Dannenberg and Diepholz. Outbreaks generally coincide with periods of drought and unusually high temperatures, and possibly populations are built up during the intervals of such conditions, when resin exudation is less active. The facts presented form only a preliminary to a study of the question.

3573. Buckner, C. H. **Predation of larch sawfly [*Pristiphora erichsonii*] by birds.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 9 (1), 1953 (2).

3574. HOUGH, J. S. **Studies on the common spangle gall of Oak [caused by *Neuroterus quercus-baccarum*]. I. The developmental history.** *New Phytol.* 52 (2), 1953 (149–77 + 2 photos). 41 refs. O.R.S.

3575. SCARAMUZZA, A. Insectos observados en *Eucalyptus* spp. **[Insects observed on *Eucalyptus* spp.]** *Boletin de Historia Natural de la Sociedad 'Felipe Poey', Habana* 2 (6), 1951 (86–9). [Span.] L.S.

A list compiled from the author's own observations and from the catalogue of insects attacking Cuban plants, drawn up by the author with S. C. Bruner and A. R. Otero. Only *Atta insularis* is considered of economic importance.

Diptera

3576. CHATTERJEE, P. N. **Notes on the biology of some gall-midges (Itonididae; Diptera) of Shisham (*Dalbergia sissoo*).** *Indian For.* 79 (4), 1953 (254).

Contarinia dalbergiae, *Sissudiplosis chatterjeei* and *Asphondylis* sp.

459. *Other Animals*

See also No. 3457.

3577. MEYER, J. Rapports entre l'évolution cytologique du tissu nourricier d'*Eriophyes macrorhynchus* Nal. et la biologie de l'acarien. **[Relationships between the cytological development of the nutritive tissue in the host of *E. macrorhynchus* and the biology of the mite.]** *C.R. Acad. Sci., Paris* 235 (23), 1952 (1545–7). 4 refs. [F.f.] O.R.S.

Describes the differences in cytological development during the presence of the fundatrix in the early stages, towards the end of May when few or no mites and eggs are present in the galls, and in July when the galls are fully populated. [Cf. *For. Abstr.* 14 (No. 1385).]

3578. KÜSTER, E. Cecidologische Notizen. IV–VII. **[Cecidological notes. IV-VII.]** *Flora, Jena* 139 (4), 1952 (526–59). 63 refs. [G.] O.B.D.

(IV) Some observations on mixed galls arising from the activity of more than one species, with special reference to the activity of aphids and mites (mainly *Eriophyes* spp.) on species of *Ulmus*, *Sorbus*, *Fagus*, and *Tilia*.

(V) Notes on the character and formation of galls on *Populus tremula* by *Phyllocoptes populi*.

(VI) Notes on the structure of leaf galls caused by mites on *Tilia*, *Acer*, *Alnus* etc., and their mode of formation.

(VII) Discusses some typical examples of the formation of leaf-margin-like structures and 'enations'.

46. DAMAGE TO TREE GROWTH BY MAN

See also No. 3456.

3579. WEITZMAN, S., and HOLCOMB, C. J. **How many trees are destroyed in logging.** *Ntheast. Res. Note Ntheast. For. Exp. Sta.* No. 17, 1952. pp. 4.

Tabulates figures showing logging damage to residual trees by diameters, and total number and volume of trees damaged in a preliminary study in W. Virginia.

3580. LYNCH, D. W. **Logging damage increases under heavy cutting of second-growth Ponderosa Pine.** *Res. Note Nth. Rocky Mt. For. Range Exp. Sta.* No. 121, 1953. pp. 3.

A felling that removed 75–80% of merchantable volume resulted in considerably higher damage than a light improvement felling removing 25–30%. The numbers per acre of damaged trees of d.b.h. 6 in. and over are shown in a table by type of damage, type of cutting and place of investigation (4 in all). An average of 7 trees/acre was completely destroyed by heavy and 2/acre by light felling; the same figures were obtained for bark injuries to trees. Four trees as against ½ tree/acre were infested by *Dendroctonus minor* after felling.

48. INJURIES DUE TO UNKNOWN OR COMPLEX CAUSES

3581. PARKER, A. K. **Pole blight of Western White Pine.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 9 (1), 1953 (4).

Of a number of fungi isolated from White Pines affected with pole blight, only a species of *Leptographium* was found capable of producing lesions similar to those associated with the disorder. The results indicate an association of *Leptographium* with pole blight, but it is doubtful whether it is its sole cause.

5. FOREST MENSURATION. INCREMENT; DEVELOPMENT AND STRUCTURE OF STANDS. SURVEYING AND MAPPING

51. SYSTEMS AND UNITS OF MEASUREMENT

3582. CURRAN, J. R. **Chain-foot converter.** *J. For.* 51 (3), 1953 (205–6).

Illustrates and explains an easily constructed and inexpensive scale for converting linear measurements in chains and links into feet.

52. MEASUREMENTS OF STEM DIMENSIONS AND VOLUME OF TREES, STANDS, FORESTS AND TIMBER

521. *Diameter (Girth) and Sectional Area*

3583. BOROWSKI, M. Wpływ błędu zaokrąglenia grubości na wynik pomiaru miąższości drewna. **[Effect of the error introduced by rounding off diameter readings on the result of timber volume measurements.]** *Sylwan* 96 (2; 3), 1952 (162–73; 269–82). 8 refs. [Pol.russ.]

An analytical study, based on the felling of 529 Pines, of the errors caused by rounding the diameter readings to the nearest cm., particularly in relation to stem ellipses, and their effect on basal area and volume. The average error in evaluating the diameter of each tree is shown to be − 0·75 cm. For the stems studied, the error involved is − 6·16%, as regards volume, and − 6·18% for basal area. A modification of Tirén's method (*Medd. Skogsforskn-Inst., Stockh.* 25, 1929) has been suggested for improving accuracy, i.e. the volume found by the

conventional 'rounded-diameter' method is multiplied by a factor equal to the ratio of the true basal area to the 'rounded-diameter' b.a.

3584. SCHAEFFER, L. Estimation des peuplements forestiers après réalisation. **[The calculation of stand volume [from stumps] after exploitation.]** *Rev. for. franç.* 5 (6), 1953 (430–2). 2 refs. [F.]

In order to determine d.b.h. of trees from the stumps left on the felling site, it is necessary first to obtain the mean diameter of stumps, (D), which entails two measurements on each—D_1 (least diameter) and D_2 (greatest diameter). Coefficient of taper (which has been determined for many species and site qualities) = d.b.h./D, and d.b.h. can therefore easily be calculated from stump measurements. The following rules of thumb have been deduced: for Oak, Beech, Hornbeam, and Maple, g.b.h. = $D_1 + D_2$; for Elm, Poplar, Scots Pine, Cherry, Alder, Robinia, and Birch, g.b.h. = $1{\cdot}2\ (D_1 + D_2)$.

3585. KORSUŇ, F. Jak měřiti středové tloušťky? **[How to measure the mid-diameter [of logs].]** *Lesn. Práce* 31 (9), 1952 (400–3). [Cz.]

Presents tabulated results of mid-diameter measurements made in the forest on 5300 stems, 3–25 m. long and 10–60 cm. in diam., of Fir, Pine, Spruce, Larch, Oak, Beech, and Hornbeam. The difference between two diameters measured (A) horizontally and (B) vertically on lying logs varied between $+4{\cdot}8$ and $-4{\cdot}5$ cm., 17·5% falling between $\pm 0{\cdot}1$ cm., and 77% between $\pm 1{\cdot}0$ cm. The average difference between the horizontal and vertical diameter is $+0{\cdot}1$ cm. The author recommends the measurement of diameter in a horizontal direction only, for logs of all diameter classes.

3586. WEST-NIELSEN, G. En grundflademåler. **[An instrument for measuring basal area.]** *Hedeselsk. Tidsskr.* 73 (16), 1952 (271–4). [Dan.] C.G.B.

Describes Bitterlich's *Winkelzahl* method, and gives details of its successful use by the Hedeselskab.

524. *Determination of the Volume of Trees and Stands*

3587. LÜNZMANN, K. Nomogramm zur Bestimmung der Holzmasse. Kubiernomogramm für Rundholz. **[Nomogram for determining timber volume. Cubing nomogram for round timber.]** *Suppl.* to *Z. Weltforstwirt.* 16 (2), 1953. pp. 4. 6 refs. [G.]

524.1. Principles of Volume Determination. Form (Taper)

See No. 3615.

524.3. Volume of Tree Groups and Stands

See also Nos. 3140–1, 3583.

3588. CLAUSER, F. Il calcolo della massa legnosa per mezzo delle tavole stereometriche nell' assestamento delle fustaie. **[The estimation of stand volume by the use of volume tables.]** *Ital. for. mont.* 8 (2), 1953 (102–8). 5 refs. [It.]

A practical note on the use of various tables.

3589. ARDENNE, M., HUGHES, E. L., and MORRISON, L. M. **Volume tables for Southern Ontario hardwoods.** *Res. Rep. Ont. Dep. Lds. For.* No. 22, 1951. pp. 60. 6 refs.

Covers *Acer saccharum, A. rubrum, A. saccharinum, Fagus grandifolia* and *Ulmus americana.*

3590. MACLEOD, W. K. **Average diameter, a basis for cruising second growth.** *Res. Note U.B.C. For. Club* No. 6, 1952. pp. 7. 5 refs.

Average d.b.h. was used as a basis for estimating volume/acre of second-growth *Populus tremuloides* stands, after correlations with average volume/tree and height/diameter had been established. Accuracy of the method was tested by comparing estimated and actual volume for each of 11 plots. Without correction for height, the calculated standard error was $\pm 5{\cdot}9\%$. When height corrections were made, the S.E. was reduced to $\pm 3{\cdot}1\%$. The method offers a rapid, accurate way of estimating volume in even-aged second-growth stands.

524.4. Recording of Data. Organization of Measuring Parties and Their Work

See also Nos. 3595, 3620.

3591. METEER, J. W. **Continuous inventory management and growth studies.** *J. For.* 51 (6), 1953 (410–4). 8 refs.

Discusses the use of permanent sample plots for management and growth studies, and in particular the use of card-sorting systems for analysing the data for continuous inventories of sample plots. The McBee Keysort manually operated system has been used successfully for this purpose; a sample card is illustrated and described in detail.

3592. **Continuous forest inventory with IBM mark sensing.** International Business Machines Corp., New York. 1952. pp. 8.

Enumeration data are recorded in the field on standard cards with a special pencil. The cards are then passed through a reproducing punch which translates the pencil marks into punched holes. The punched cards are then used (in a card-sorting machine) in the preparation of a report.

524.6. General Surveys of Forests and Whole Tracts of Forest. Partial Enumeration Surveys, Timber Cruising

3593. CLARKE, W. B. M. **The forest resources inventory of Ontario 1946–1952.** *For. Chron.* 29 (1), 1953 (31–9).

A short account of organization, methods etc.

3594. **Continuous forest inventory.** *Sth. Lumberm.* 186 (2331), 1953 (44–5).

Describes briefly the methods used in inventories in the Great Lakes and Central States regions. The cost, which covers 2 inventories in a 10-year period, for complete inventories of forests in the 100,000- to 500,000-acre class is 1–2 cents/acre/year.

3595. **Forest survey field instructions for ground sample plots in Louisiana, Texas and Oklahoma.** Division of Forest Economics, Southern Forest Experiment Station, New Orleans, La. 1952. pp. 53 + 1 map + 1 tbl. + 8 blank forms.

Includes detailed instructions on preparing maps, photos, and plot records, photo interpretation, field

classification of land use, sample-plot location, tree tally on sample plots, classification of sample plots, tally of (resinous) stumpwood, tally of recent stumps to estimate drain, type mapping on photos, and other records.

3596. Grapp, L. O. **Procedures for analyzing small woodlands.** *J. For.* 51 (4), 1953 (269–74).

Describes procedures developed and used in Region Nine of the U.S. Forest Service for a rapid assessment of management possibilities for owners of small woodlands.

3597. Wikstrom, J. H. **Strip sample versus circular plots for measuring mortality.** *Res. Note Nth. Rocky Mt. For. Range Exp. Sta.* No. 120, 1953. pp. 1.

Measurements of mortality on 34 paired samples showed no statistically significant differences between results from a strip plot 1 chain wide and 7 chains long and 2 circular $\frac{1}{3}$-acre plots spaced 5 chains apart. Men working alone prefer the circular plots because only half the time is needed to tally the trees, the boundary of the plot is easier to determine, and there is less perimeter and therefore less danger of error.

525. *Volume by Assortments. Merchantable Volume*

See also Nos. 3479, 3481.

3598. McClay, T. A. **Estimating board widths obtainable from Pine trees of different diameters.** *Res. Note Stheast. For. Exp. Sta.* No. 25, 1953. pp. 2. 1 ref.

Figures from a table to show % of board widths cut from Loblolly and Shortleaf Pine trees of different diameters are shown to conform reasonably closely wih actual board width % obtained from a number of timber sales.

3599. Kværness, R. Skadeberegning for stående granskog. [**Calculating damage in standing Spruce.**] *Tidsskr. Skogbr.* 61 (4), 1953 (157–9). [Nor.]

A method is described of determining the volume to be deducted for visible defects from the total volume of a tree. The tree's height is divided into 10 equal sections and the volume of each section as a % of the total volume is obtained from a table covering tree heights of 8 to 26 m., and d.b.h. of 10 to 40 cm. The proportional size of the defect in relation to the section in which it occurs is then estimated.

526. *Log Measurement. Scaling*

See also Nos. 3585, 3587.

3600. Roupec, J. Přesnost hmotových tabulek. [**Accuracy of [Baur's log] volume tables.**] *Lesn. Práce* 30 (4), 1952 (334–9). [Cz.russ.]

The author has compared the volume after felling of 300 Spruce trees having stems over 7 cm. diam. o.b. at the small end, by 3 methods: (1) Huber's method, based on 1-m. sections, (2) Baur's volume tables published in his '*Formzahlen und Massentafeln der Fichte*', and (3) the simplified Huber method, using mid-diameter and length. Baur's tables gave results for which the mean error was $-0{\cdot}23\%$ and the variance $\pm 7{\cdot}66\%$; for (3) the respective figures were $+0{\cdot}28\%$ and $\pm 5{\cdot}5\%$.

3601. Ollinmaa, P. J. Kuutioimiskaavojen ja kuutioimistaulukoiden tarkkuudesta kokonaisten runkojen kuutiomisessa. [**The accuracy of some volume formulae and volume tables in calculating the volume of whole stems.**] *Metsät. Aikak.* 1953 (1; 2), (22–8; 56–60). 9 refs. [Fi.e.]

Results of an investigation based on 190 Scots Pine, 162 Norway Spruce and 98 Birch from eastern Finland are given in tables with English legends. Huber's method of cubing in one- and 2-m. lengths is taken as giving the most accurate results, and results from the use of various formulae and volume tables in cubing whole logs are compared with them. Hossfeld's formula gave the best results for Pine and Ilvessalo's tables for Spruce and Birch, although Hossfeld's and Huber's formulae were more reliable for Spruce and Birch with diameters below 5 cm. Hossfeld's formula was also preferable for single trees of Spruce and Birch.

3602. Orchard, C. D. **Cubic scale in British Columbia.** *For. Topics B.C. For. Serv.* No. 4, 1952. pp. 13. Also in *B.C. Lumberm.* 37 (2), 1953 (43, 89, 92 . . . 100, 104 . . . 107).

A comparison of the accuracy of the standard British Columbia board-foot log scale with a cubic-foot log scale, to the advantage of the latter.

53. SPECIAL MEASUREMENTS OF TREES AND STANDS (CROWN DIMENSIONS, STAND DENSITY ETC.)

See also Nos. 3359–61, 3377.

3603. Elagin, I. N. O metodike izučenija proekcij kron mnogojarusnyh drevostoev. [**Method of investigating the crown projections of several-storeyed stands.**] *Dokl. Akad. Nauk SSSR* 85 (4), 1952 (905–8 + 1 plate). 6 refs. [Russ.] A.P.B.

In the method described, each plot is divided by stretched lines into quadrats of 2 m. side and a plan is made on which the position of the base of each tree is recorded. The crown projections are then plotted by observation with a Brandis 'eclimeter' [hypsometer?] used in the strictly vertical position (for which a special graduation had to be added to the model available) and measurement of the distance to the axis of the stem. The results are accurate to 0·5 m. for trees 30–32 m. high. For regular crowns only 4 points are determined (N., S., E and W.); for irregular ones, e.g. of Oak or Maple, extra plottings are made as necessary. At the same time the storey to which the crowns belonged, is recorded by using various types of line (solid, broken etc.) for their outlines. The plan obtained is transferred to stout white paper and the crown projections blocked in with different colours for each species, distinguishing between the 3 storeys by using light colours for the main canopy, medium for the second, and dark for the third. Where crown projections overlap, the different colours are cross-hatched appropriately. One such plan is reproduced in colour. A convenient method of quantitative analysis of the crown relations revealed, is to weigh the whole plan (correct to 5 mg.) and then to cut out and

weigh the individual projections. Some figures obtained by this method in 3-storeyed, mixed, ca. 220-year-old Oak woods in the Tellerman experimental forest are tabulated and discussed. In each of several forest types 1200–2000 sq.m. were mapped, using plots 400 sq.m. in area (3–5 plots per type). It is noted *inter alia* that the gaps in crown cover accounted for 9–12% and 38–39% respectively of the plot area for crown densities of 0·8 and 0·6 – 0·5 by ocular estimation.

3604. Obalil, Z. Vztah mezi hmotou a korunou stromu v lese smíšeném. [**Relationship between the stem volume and crown dimensions of trees in mixed forest.**] *Práce výzkum. Úst. lesn. ČSR* No. 2, 1953 (111–33). [Cz.cz.russ.g.]

Presents tabulated results of correlations based on measurements in a mixed stand near Opocno, Czechoslovakia. The area of the stand is 10·68 ha., its volume was reduced by fellings from 241 cu.m./ha. in 1930 to 189 cu.m./ha. in 1947, while the m.a.i. during the period 1930–47 was 2·8 cu.m./ha. For the two main species (Pine and Spruce) the stem-volume/crown-volume correlation coefficients are higher than those for stem-volume/crown-diameter or crown projection area; but for Pine the coefficient is only 4% higher, whereas that for Spruce is 42% higher. The difference is explained by the effect of light and the different shade-bearing abilities of these species.

54. ASSESSMENT OF SITE QUALITY

See also Nos. 2993–6, 3398, 4017–8.

3605. ***Mitteilungen des Vereins für forstliche Standortskartierung.*** Eugen Ulmer, Stuttgart, z.Z. Ludwigsburg.

It is proposed to publish in this series results of basic research, information on regional site types, and investigations on the relationship between site and yield of different timber species. No. 1 was published in August, 1951. Abbreviation in *For. Abstr.: Mitt. Ver. forstl. Standortskart.*

3606. Coile, T. S. **Soil and the growth of forests.** *Repr.* from *Advances in Agronomy, New York* 4, 1952 (330–98). 79 refs.

Reviews the existing information from literature on forest site quality and soil fertility in the U.S.A. The material is dealt with by the main forest regions.

3607. Coile, T. S., and Schumacher, F. X. **Site index of young stands of Loblolly and Shortleaf Pines in the Piedmont plateau region.** *J. For.* 51 (6), 1953 (432–5). 5 refs.

Site index based on soil variables [cf. *For. Abstr.* 10 (No. 1499)], was determined for a number of young stands, and new site-index curves are given.

3608. Bennett, F. A. **Site indexes of the soil series on the George Walton Experimental Forest [Georgia].** *Res. Note Stheast. For. Exp. Sta.* No. 34, 1953. pp.2.

The site indexes show that the 'drains' or poorly drained areas are the best sites for Slash Pine and that on identical soils Slash Pine has a higher site index than Longleaf.

55. AGE DETERMINATION

See Nos. 3189, 3618, 3625.

56. INCREMENT, DEVELOPMENT AND STRUCTURE OF STANDS

See also Nos. 3139–41, 3228, 3256, 3259, 3265, 3337–8, 3340, 3357 *et seq.*

3609. Korsuň, F. Zákon vzrůstu. [**The law of growth.**] *Lesn. Práce* 29 (7/8), 1950 (319–32). 3 refs. [Cz.russ.]

Contrary to the opinion of most specialists, the author claims, on the basis of numerous personal and other experimental data, that the curves of the height, diameter, and volume increment of single trees, as well as the curves of basal area and volume increment of even-aged stands, satisfy only two conditions, viz. they pass through the origin, and at a certain age have a maximum point. The third condition (an asymptote parallel to the age axis, to be attained at an infinitely great age) is not fulfilled. Each curve is expressed by the author's formula

$$y = ax^{(b + c \log x)}$$

where x = time, and a, b, and c are constants. A general law of increment, valid for both single trees and whole stands, does not exist. On the other hand, the increment curve of the mean crop height fulfils all three conditions, and can be expressed by the author's formula

$$y = \frac{x^2}{A + Bx + Cx^2}.$$

The same formula (or a simpler one, without the square term in the denominator) can be used for the average diameter increment. These two formulae (and those obtained by the differentiation and double differentiation of the logarithmic formula, for determining the current increment and moment of its peak value) have been used to express the findings of several surveys carried out in a Carpathian forest reserve and in an experimental forest. The results are presented in tables and graphs, and the values of various coefficients evaluated, for Silver Fir, Beech, Oak, Pine, Larch, and Spruce trees and stands, thus enabling various important data to be calculated viz. [the first figure denotes the age of the maximum current volume increment; the second, the age at which even-aged stands will have the maximum volume; the third, the maximum volume/ha. at the age of 100 years]: Pine—26, 322, 450 cu.m.; Larch—29, 243, 490 cu.m.; Spruce—34, 192, 570 cu.m.; Fir—43, 338, 600 cu.m., Beech—50, 409, 435 cu.m.; and Oak—57, 364, 380 cu.m.

3610. Herman, F. R. **A growth record of Utah Juniper in Arizona.** *J. For.* 51 (3), 1953 (200–1).

Presents growth data from a permanent sample plot of pure *Juniperus utahensis.*

3611. Kabzems, A. **The growth and yield of Black Spruce [*Picea mariana*] in Saskatchewan.** *Tech. Bull. For. Br. Sask.* No. 1, 1953. pp. 52. 4 refs.

Based on 150 $\frac{1}{5}$-acre permanent sample plots established in 1951 and supplemented by stand tables for 20-year age groups.

3612. HAWLEY, N. R. **Rapid growth of planted Slash Pine in the middle coastal plain of Georgia.** *Res. Note Stheast. For. Exp. Sta.* No. 32, 1953. pp. 1.

Gives data for height, d.b.h., diameter of largest tree, b.a., cordwood volume, number of sawtimber trees and sawtimber volume in 1948 and 1953 of Pine planted in 1935.

3613. GUILKEY, P. C. **Jack Pine growth rates in Minnesota.** *Tech. Note Lake St. For. Exp. Sta.* No. 394, 1953. pp. 1.

3614. SUSMEL, L. Capacità produttiva delle specie legnose. [**The productive capacity of woody species.**] *Monti e Boschi* 4 (2), 1953 (51–8). 14 refs. [It.f.e.]

Compares the yield of three typical, pure, even-aged stands of Spruce, Poplar, and Eucalypt [*E. rostrata*] having respective rotations of 150, 15, and 12 years. M.a.i. in volume is in the ratio 1 : 2·9 : 3·6, but increment in dry-wood weight is in the ratio 1 : 2·8 : 5.

3615. BAUER, F. Die Roteiche [***Quercus borealis***]. J. D. Sauerländer's Verlag, Frankfurt a.M. 1953. pp. viii + 106. 116 refs. [G.e.]

A general study of this species as grown in W. Germany and Holland, with chapters on:—Aims; previous studies. Nomenclature, botanical characters and natural range; cultivation in Europe. Material and region concerned in the present study (numerical data are based on measurements of 114 temporary sample plots in W. Germany and Holland, with 15 plots of native Oak—*Q. robur* and *Q. sessiliflora*—for comparison). Increment and yield, with sections on stem form, bark and sapwood %; development of pure stands, with a provisional yield table; and comparisons of the data obtained with data for the same species in the U.S.A., or with yield-table data for other species grown in Germany, along with figures for stands of *Q. borealis* and native Oak on the same site and of *Q. borealis* on different sites in the region. Abiotic and biotic injuries. Silvicultural behaviour in pure and in mixed stands. Wood anatomy, physical and mechanical properties (based on 20 logs from 35- to 70-year-old stands in 18 districts, plus material from one tree each of *Q. borealis* and native Oak of equal age and from the same stand), and potential uses—including results of some trials for high-grade veneer and furniture.

In general, *Q. borealis* is viewed as a valuable species for this region—especially for farm forests, being adaptable to poorer sites (if drainage is good, i.e. on loamy sands or sandy loams) and capable of producing large timber more rapidly than the native species of Oak. Its increment begins to decline steeply at about 80 years of age, and 100 years is considered the most suitable rotation. The wood, though appearing to be of limited use for high-quality veneer and furniture, has excellent strength properties and is suitable for a wide range of uses.

3616. SETTEN, G. G. K. **A note on the growth and yield of Berus, *Bruguiera cylindrica* (L.) Bl. (syn. *Bruguiera caryophylloides*, Bl.), in Selangor.** *Malay. Forester* 16 (2), 1953 (74–87 + 4 photo + 3 gphs.). 6 refs.

561. *Increment in Height, Diameter, Basal Area, Form and Quality. Variations and Trends; Dendrochronology*

See also Nos. 3137, 3152.

3617. CRUTTWELL, C. R. **The influence of altitude, density of stocking, and exposure on the height growth of *Pinus radiata* in Beaumont Forest.** *N.Z. J. For.* 6 (4), 1952 [1953] (330–3).

Measurements made in the course of a line-plot assessment have been used to prepare a table that shows how height growth is influenced by density of stocking, altitude and exposure. The preparation and use of the table are briefly discussed. The results indicate that differences in altitude have little influence on height growth, as compared with that of density of stocking and exposure to high winds in this region of New Zealand.

3618. HARRIS, J. M. **Discontinuous growth layers in *Pinus radiata*.** *For. Prod. Res. Notes N.Z. For. Serv.* 1 (4), 1952 (1–10). 7 refs.

Suppressed trees frequently possessed fewer than the expected number of annual rings at the base of the tree, and the cambium at the base of one 24-year-old tree had remained dormant for an estimated 11 years. Physiological implications are briefly considered. Where no whorl of branches is formed at the overwintering bud of hypertrophied leading shoots, internodal length of the mature tree may give a false impression of annual height increment. *From author's summary.*

3619. WATT, R. F. **Western White Pine stands show irregular growth pattern.** *Res. Note Nth. Rocky Mt. For. Range Exp. Sta.* No. 113, 1952. pp. 1.

Yield tables for the Western White Pine type show a regular accretion of basal area and of cu. ft. and bd. ft. volumes. Records over 25 years of 7 sample plots in Clearwater National Forest illustrate the irregularity, due mainly to attacks by *Dendroctonus monticolae* and wind and snow damage, between 5 successive 5-year growth periods. The average annual growth over the 25-years was 490 bd. ft./acre as against 667 bd. ft. predicted by the yield tables.

565. *Sample-Plot Technique*

See also No. 3591.

3620. MARCKWORTH, G. D., MCKAY, D., and GROSS, W. C. **Techniques for establishing permanent growth plots in the Douglas Fir region.** *Report, West Coast Forestry Procedures Committee, Western Forestry and Conservation Association* [*Portland*] No. 8, [1952] (59–67). Many refs.

Makes recommendations on selection of plots, their size and shape, marking and referencing, description and records, measurement of trees, and re-examination, with the aim of establishing a standardized system so that results of studies can be compared.

566. *Yield Tables and Their Construction*

See also No. 3371.

3621. SCHOBER, R. Ertragstafel und Forsteinrichtung. **[Yield tables and forest management.]** *Forstwiss Cbl.* 72 (1/2), 1953 (1–13). 7 refs. [G.]

Reviews the history of the use of yield data in forest management and discusses the adequacy of the data now available for present and future management. Future investigations should deal with the relationship of site factors to crop quality and the more detailed interrelationships of site and specific growth characteristics of the trees. For mixed stands, studies should be directed to the changes in yield caused by the influence of species upon each other. The author demonstrates the errors that are apt to occur in calculating the annual cut from current growth data, and states that future investigations should follow the traditions of Schwappach, Wiedemann and Zimmerle.

3622. **Forestry Commission yield tables for Scots Pine and other conifers.** H.M. Stationery Office, London. 1930 [reprinted 1952]. pp. 24. Price 1*s.* 3*d.*

Contains yield tables and height curves for Scots Pine, European and Japanese Larch, Norway and Sitka Spruce and Douglas Fir.

3623. WESTVELD, M. **Empirical yield tables for Spruce-Fir cut-over lands in the Northeast.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 55, 1953. pp. 64. 8 refs.

Describes the development (by multiple-correlation analysis) and application of provisional yield tables in cu. ft. and cords for dominant and secondary softwood sites, and of alinement charts.

3624. ANTONIOTTI, G. B. Saggio di una tavola alsometrica delle fustaie di cerro del Molise. **[A tentative yield table for even-aged *Quercus cerris* stands in Molise.]** *Ital. for. mont.* 8 (1), 1953 (38–41). [It.it.f.]

568. *Other Mensurational Studies of Stand Constitution and Changes therein. Distribution of Growth by Tree Classes etc.*

3625. MAYER-WEGELIN, H., and SCHULZ-BRÜGGEMANN, M. Untersuchungen über den Bestandsaufbau im Kleinen Urwald des Rothwaldes. **[Studies of stand constitution in the Kleiner Urwald, Rothwald.]** *Zbl. ges. Forst- u. Holzw.* 71 (4), 1952 (303–31). 49 refs. [G.g.e.]

Gives the results of a study made to elucidate the age structure of a 0·2-ha. plot of virgin Beech/ Norway Spruce/ Silver Fir forest in the Kleiner Urwald, at ca. 1000 m. alt. on the slopes of the Dürrnstein, Rothwald (Austrian Alps). The methods of age determination and analysis used are described. The complete cycle of development appears to last ca. 250–275 years, including a period of ca. 100 years during which, owing to shading by two closed, superimposed storeys, no regeneration takes place. Beech and Fir regeneration, regularly distributed over the whole area, comes in up to 50 years before that of Spruce, which regenerates almost exclusively on fallen stems. The maximum age for Beech is 450–500, and for the conifers 500–600 years. At present there is an upper storey composed of (*a*) a few Spruce and Fir 425–525 years old—the remains of an age class the bulk of which would have been formed 525–575 years ago—and (*b*) a generation of all 3 species, of average age 275 (150–350) years; and a lower storey of (*c*) dense regeneration of Beech (up to 50 years) and Fir (up to 25 years), with Spruce regeneration just starting. The development from this point (I) is pictured as follows: (II) After 100 years (*a*) will have vanished, while (*b*) and (*c*) will form two closed storeys preventing further regeneration. Some of the Beech in (*b*) will be reaching its age limit; (*c*) will be dominated by Beech, with somewhat younger Fir and much younger Spruce. (III) In a further 100 years' time (*b*) will have lost more than half its Beech, and this opening will now begin to permit regeneration, while (*c*) will be in the main phase of its height growth, with Beech still predominant in its upper canopy. (IV) 50 years later, (*b*) will consist of conifers only, and some of these will be approaching their age limit; (*c*) will form the main canopy, and its conifers will be emerging above the Beech; regeneration, especially of Beech, will have started in earnest. In 2–3 decades, this will lead back to (I).

3626. DRINKWATER, M. H. **A study of development in a virgin Hemlock [*Tsuga canadensis*] stand, Queens County, Nova Scotia.** *Silv. Leafl. For. Br. Can.* No. 72, 1952. pp. 5. 3 refs.

Data on structure and development were obtained from permanent sample plots established in 1950 in 200- to 300-year-old virgin stands.

3627. MATHAUDA, G. S. **The tree species of the [virgin] tropical evergreen ghat forests of Kanara (Bombay) and their rate of growth.** *Indian For.* 79 (4), 1953 (208–33). 2 refs.

Information collected between 1939 and 1949 from 4 permanent, linear, tree-increment plots, 1 chain wide and 27·5—67 chains long at altitudes ranging from 470 to 2000 ft., included the following: (1) Of 4002 stems present, 3981 belonging to 130 species were identified. Numbers of species in individual plots varied from 56 to 76 and their proportion from 0·1 to 17·9%. The number of natural orders varied from 26 to 32, and the number of species in the top canopy from 26 to 60. (2) A few species occurred throughout the altitudinal range, others being found characteristically at the higher or lower altitudes. Some species were scattered all through the plots as single trees or very small groups, while others were found in groups of varying sizes. (3) In each plot, and in the hypothetical crop represented by their averages, the number of trees in successive diameter classes formed a geometric series proving that de Liocourt's law relating to balanced uneven-aged diameter distributions also applies to virgin tropical forests. The law was also found to apply to mortality in the plots. Average growth rates of 19 of the most frequently occurring species are presented and details of the distribution of the species identified throughout the plots are given in tables.

58. SURVEYING AND MAPPING (INCLUDING AERIAL SURVEYS)

See also No. 3595.

3628. **Forest survey field manual Northeastern States.** Northeastern Forest Experiment Station, Upper Darby, Pa. 1949 (rev. 1952). pp. 122.

Contains sections on: classification of land ownership; aerial photo interpretation; selecting and locating field plots; examining field plots; forest type mapping; preparation of progress reports; and checking.

3629. **Forest survey field manual Northeastern States. Supplement 1.** Northeastern Forest Experiment Station, Upper Darby, Pa. 1952. pp. 10 + [2].

Contains additional information on aerial photo interpretation, 'growth' plots (i.e. plots on which 4 times the usual number of sample trees are measured and are recorded so that they can be re-measured at the next survey), pulpwood specifications, recording sample trees (to show sawlog material, merchantable height and pulpwood), and stocking determination.

3630. MASON, B., JR. **A forest survey in Guatemala.** *Photogrammetric Engineering, Menasha, Wis.* 18 (1), 1952 (140–3).

A short account of an aerial survey of the dense tropical forests of El Petén, Guatemala.

3631. ZONNEFELD, J. I. S.; COHEN, A.; EIJK, J. J. v. D.; BELTMAN, B. J. **The use of aerial photographs in a tropical country (Surinam). A symposium.** *Photogrammetric Engineering, Menasha, Wis.* 18 (1), 1952 (144–68). 15 refs.

A complete aerial survey of northern Surinam was made in 1947–8. Papers printed here deal with topographic maps, geological reconnaissance, forest photo interpretation and soil mapping. It is concluded that aerial survey cannot replace, but is most valuable in supplementing, ground cruising.

3632. HANNIBAL, L. W. **Aerial forest photo interpretation in Indonesia.** *Docum. FAO Asia-Pacif. For. Comm. 1952* No. 75, 1952. pp. 23 + 1 tbl. Limited distribution: FAO, Rome.

Includes an account of work done in 1949 on aerial photos (scale 1 : 10,000) of the Malili forests in the Celebes.

3633. Pemakaian potret-udara untuk membuka hutan² didaerah Luar Djawa. [**The value of the interpretation of air photographs for forest exploitation in the islands outside Java.**] *Rimba Indonesia* 2 (3), 1953 (87–98 + 1 photo). [Jav.e.]

Discusses the general value of aerial photographs, and work by the reconnaissance section of the Planning Division of the Forest Service. [Cf. *For. Abstr.* 13 (No. 555).] *From author's summary.*

3634. CUNNINGHAM, R. N., BRYAN, M., and MOESSNER, K. **Land use and forest survey of the Ryukyus.** *Docum. FAO Asia-Pacif. For. Comm. 1952* No. 52, 1952. pp. 15 + 6. Limited distribution: FAO, Rome.

The time and funds available made necessary a diffused-sampling survey. In general, the sampling plan was based on that used by the U.S. Forest Service in the eastern United States, except that in the Ryukyus survey the non-forest land was classified, and gross timber volume was estimated from measurements on air photos. Altogether, 59% of the land was found to be forest (mainly evergreen hardwoods). Trees are generally short and of small diameter. The primary steps of the sampling were: (1) a stereo dot count to determine the proportion of land in the more important use-classes; (2) detailed stereo interpretation of a portion of the dots examined in step (1), to determine the proportion of the dots falling in each of the forest-land classes and the gross cubic volumes/acre on the forest land; (3) a ground check of about $\frac{1}{8}$ of the photo-interpreted forest dots; (4) a detailed tally of trees on sample plots at the ground-check points to obtain data on species composition, tree sizes, timber quality, growth etc.; (5) application of sampling data to known acreages, and summarization of timber volume in appropriate units. The various steps are described in detail and the application of this type of survey to other areas is discussed.

3635. COSMA, D. Norme pratiche per l'interpretazione delle fotografie aeree. [**Practical standards for the interpretation of aerial photographs.**] *Ital. for. mont.* 8 (1), 1953 (42–7 + 10 photos). 4 refs. [It.it.f.]

With special reference to Italian conditions.

3636. MOESSNER, K. E. **An aerial photo scale-protractor.** *Sta. Note Cent. St. For. Exp. Sta.* No. 74, 1953. pp. 2.

Describes with illustrations the photo scale-protractor, printed on heavy transparent film and consisting of 3 different scales for measuring distance and area on aerial photographs of scales ranging from 1 : 19,500 to 1 : 22,500, a scale graduated in inches and tenths, and a small protractor.

3637. BÄCKSTRÖM, H., and WELANDER, E. En undersökning av remissionsförmågan hos blad och barr av olika trädslag. [**An investigation on the diffuse reflection capacity of leaves and needles of different species.**] *Norrlands SkogsvFörb. Tidskr.* 1953 (1), (141–69). 10 refs. [Sw.sw.e.]

The report is based on nearly 1000 curves for leaves and needles of Swedish trees, measured with Beckman's spectrophotometer. Measurements were made chiefly for the wave-lengths 5500Å and 8250Å, which had been found in preliminary investigations to give characteristic results. At the infra-red end of the spectrum the reflection capacity was far higher when measurements were made on a number of leaves laid on top of each other than on individual leaves. Measurements were therefore made on bundles of 10 leaves. Values were not appreciably changed by the lapse of time between picking and measurement, so long as the twigs were kept in water. No direct connexion was found between meteorological factors during the 1951 growing season and reflection values. Values for July–Sept., based on several samples from the same tree and for different trees of the same species, are tabulated with their standard errors. The effect of tree age and site quality on reflection capacity were slight, but Spruce

and Pine values may vary widely for different localities. At 5500Å hardwood values were high in spring, falling in June–July and rising again in late September to give a V-shaped curve; values for conifers fell slightly from spring to autumn. In the infra-red, values for hardwoods declined from 70–72% in May to 42–59% in October, and values for Spruce and Pine also declined slightly during the same period. Between 24 July and 30 Sept. 1951 a large number of trees were measured at 6 different times. The average of the 6 measurements and the standard error are tabulated. A discussion of the photographic importance of this report will be published shortly. [Cf. *For. Abstr.* 14 (No. 561).]

6. FOREST MANAGEMENT. BUSINESS ECONOMICS OF FORESTRY. ADMINISTRATION AND ORGANIZATION OF FOREST ENTERPRISES

61. FOREST MANAGEMENT: GENERAL, THEORY AND PRINCIPLES

See also Nos. 3621, 4009.

3638. KNUCHEL, H. [Translated by M. L. ANDERSON]. **Planning and control in the managed forest.** Oliver and Boyd, Edinburgh. 1953. pp. xvi + 360 + 7 photos. 9 pp. of refs. Price £1. 15*s*.

Translation of the German text published in 1950. [Cf. *For. Abstr.* 12 (No. 2516).]

3639. HURSH, C. R. **Forest management in East Africa in relation to local climate, water, and soil resources. Report and recommendations.** *Rep. E. Afr. Agric. For. Res. Organ. 1952* [1953] (26–35).

Recommends lines of research that should be pursued in Kenya, Tanganyika, and Uganda.

62. WORKING PLANS. ANNUAL OR PERIODIC YIELD. YIELD REGULATION

See also Nos. 3224, 3237, 3621.

3640. BRASNETT, N. V. **Flexibility in forest management.** *Emp. For. Rev.* 32 (2), 1953 (142–3).

A warning against the dangers of rigidity in following working plans regardless of circumstances, especially in tropical forests.

3641. BOURGENOT, L. Un disciple peu connu de Gurnaud: Brenot, et sa méthode d'aménagement des sapinières. **[Brenot, a little known disciple of Gurnaud, and his method of managing Silver Fir.]** *Bull. Soc. for. Franche-Comté* 26 (8), 1952 (425–42). 8 refs. [F.]

3642. ANDERSON, M. L. **Plea for the adoption of the standing control or check in woodland management.** *Scot. For.* 7 (2), 1953 (38–47).

Application of the méthode du contrôle, in a form adapted to British conditions, is advocated.

65. SPECIAL BUSINESS PROBLEMS OF TIMBER-GROWING. CALCULATION OF COSTS AND PROFITABILITY. VALUATION

See also Nos. 3366, 3372, 3385, 3455.

3643. FRYJORDET, T. Om lønnsomheten av å dyrke gran på Vestlandet. **[Financial aspects of establishing Norway Spruce plantations in W. Norway.]** *Medd. Vestland. forstl. Forsøkssta.* 9 (3) (Ser. No. 30), 1952 (245–316). 21 refs. [Nor.nor.e.]

Discusses the yield of Spruce in W. Norway as given by Brantseg's tables [see *For. Abstr.* 13 (No. 3206)], which form the basis of the present work. The measure of profitability used is the capital value of the stand at age 0 (returns minus costs, both discounted), to facilitate the calculation of which the author has worked out and tabulated, for each site class, values of total returns discounted to year 0. As future values are impossible to predict, static prices are assumed. The calculations involved are illustrated by an example showing the method of graphical integration used to find total discounted returns from annual fellings. A complete value equation is then developed to show the effect of including soil expectation value (Faustmann) in the equation for capital value, which as used above does not include the value of the land released in year *n*. Using the procedure of Jørgensen and Hermansen [see *For. Abstr.* 14 (No. 572)], but with a slightly different equation for capital value, the author calculates and tabulates values for the financial rotation in the various site quality classes, and goes on to demonstrate a graphical solution of an equation for the financial yield, and to consider the effects of increased prices for timber in the smaller diameter classes and of changes in other price levels —e.g. a rise in the general price level. Formulae are then developed for the expectation value of a stand and the total capital value of stand plus land, in any year from 0 to *n*; tables are given for all site qualities to show gross expectation values from which the expectation values of a stand may be obtained by making a specified deduction for interest. A final chapter makes a critical examination of the conditions assumed and the results obtained, and compares results based on the yield tables of (*a*) Brantseg, and (*b*) the Norwegian Forest Research Institute.

The chief formulae used are reproduced in the English summary, and all graphs and tables have English as well as Norwegian text.

3644. SULLAND, A. Sammenliknende kalkyle over lønnsomheten av slip og kubb, vedtømmer og ved av gran. **[Calculations on the comparative profitability of timber-length pulpwood, short pulpwood, fuelwood in timber lengths and fuelwood, of Spruce.]** *Tidsskr. Skogbr.* 61 (4), 1953 (147–52). [Nor.]

The study is concerned primarily with the most profitable disposal of thinnings from young plantations. Figures showing the value obtained (prices for 1952–3) in kroner/tree for trees of d.b.h. 9·1, 11·3 and 15·5 cm. are tabulated and recommendations are made for obtaining the maximum value from combinations of the different assortments. The calculations were based on solid volume, and volumes of short pulpwood and fuelwood were

converted from stacked to solid volume for comparison.

3645. JØRGENSEN, F. Priskoblingsberegning for fyrstikvirke av asp. [**Price correlation calculation for Aspen match timber.**] *Medd. norske Skogforsøksv.* 11 (3) (No. 40), 1952 (569–618). 13 refs. [Nor.nor.e.]

The calculations are intended to establish a price correlation between Spruce and match timber from Aspen in order to obtain the same financial return from both species. Figures for yields, prices etc. on which the calculations are based are given in tables with English legends. The '[silvicultural] balance number' (net value of thinnings and main crop discounted to the time of formation of the stand) for Aspen pulpwood and firewood is subtracted from the balance number for Spruce, the difference being the balance number for match timber. To give the average price for match timber, this figure is divided by the 'volume balance number'. [The sum of intermediate and final yields from a stand by volume, to which—purely as a convenience in calculation—discount back to the year of formation has been applied (as if volume were value), in such a manner that multiplication of this 'discounted' volume by the average net price/cu.m. on stump gives the '(silvicultural) balance number'—see *For. Abstr.* 14 (No. 570).] If this price is paid for all match timber, the financial return from Aspen and from Spruce will be the same, assuming equal costs of cultivation and maintenance for both species. Figures showing the division of the common price among the different dimensions are tabulated. Factors on which the calculations are based and the effect on the results of any variation in them are discussed. The choice of comparable site-quality classes for the calculations is considered the factor most likely to influence the results. *From author's summary.*

3646. BØRSET, O. Ospeskogbrukets lønnsomhet. [**The profitability of Aspen.**] *Tidsskr. Skogbr.* 61 (4) 1953 (121–32). 10 refs. [Nor.]

On the basis of production figures for Aspen in Norway and Sweden and of calculations on price relationships between Spruce and Aspen [cf. preceding abstract] it is concluded that at present prices in Norway, Aspen is as profitable as Spruce.

3647. BECKING, J. H. Het dunningsvraagstuk. [**The problem of thinning.**] *Ned. Boschb.-Tijdschr.* 25 (4), 1953 (85–8). [Du.]

A paper on the economics of thinning Douglas Fir, read at a meeting of the Nederlandsche Boschbouw Vereeniging in Nov. 1952, with discussion. [Cf. *For. Abstr.* 14 (No. 1453).]

3648. WORRELL, A. C. **Costs of practising forestry in the South.** *Sth. Lumberm.* 186 (2325), 1953 (43–4).

Tabulates figures based on a survey in the 11 southern States showing labour and total costs/acre for forestry operations, timber marking costs/unit of volume and fencing and road-making costs/mile.

3649. TOFANI, M. Sull'affitto dei boschi in Toscana. [**The leasing of woodland in Tuscany.**] *Ital. for. mont.* 8 (1), 1953 (10–8). 10 refs. [It.it.f.]

Discusses the difficulties involved in leasing woodland and illustrates the theme by a celebrated law case involving the lease of an area of coppice-with-standards in Tuscany. Suggests simple methods of volume estimation and valuation as the basis for leases.

66. COSTING OF LOGGING OPERATIONS

See also Nos. 3425, 3644.

3650. MIYOSHI, S., and OGATA, Y. [**The management of the natural forest of Shii (*Shiia*) and Kashi (*Cyclobalanopsis*) in Miyazaki. (No. 3). The felling and extraction of Shii and Tabu.**] *J. Jap. For. Soc.* 34 (2), 1952 (43–5). [Jap.e.]

Costings for felling, trimming, cross-cutting, barking and transport of Shii and Tabu [*Machilus thunbergii*] showed the stumpage values for pulpwood to be 214% above that for charcoal wood. The additional value of such utilization for the natural forest is stressed. [Cf. *For. Abstr.* 13 (No. 3879).] *From authors' summary.*

67. ASSESSMENT OF FINANCIAL RESULTS; BOOK-KEEPING AND ACCOUNTANCY; BUSINESS STATISTICS; SHORT-TERM PLANNING AND FINANCING

3651. ČERMAK, K., and HYBL, J. Evidence hospodaření podle norem v lesnictví. [**Forest accountancy in accordance with quotas [targets].**] *Práce výzkum. Úst. lesn. ČSR* No. 2, 1953 (59–86). 18 refs. [Cz.cz.russ.e.]

Describes the Soviet methods of accountancy introduced into Czechoslovakia in 1951–2.

3652. SADOWSKA, E. Metodyka obliczania produkcji globalnej i czystej leśnictwa. [**Methods of assessing the financial value of the gross and net forest production.**] *Prace Inst. Bad. Leśn.* No. 88, 1953. pp. 35. 11 refs. [Pol.russ.] Price *Zł.*3·90.

Describes methods developed and adopted by the Polish Central Statistical Office for the evaluation of the total and net forest production, following the example of the U.S.S.R. After 1947, official Polish statistics include forest production in general agricultural production.

68. ADMINISTRATION AND ORGANIZATION OF FOREST ENTERPRISES

681. *National (Federal, State) Forest Services and Administration*

3653. BEALL, H. W. **The federal-provincial forestry engagements.** *For. Chron.* 29 (1), 1953 (20–30).

Outlines the progress so far made in implementing the 8 federal-provincial forestry agreements executed in accordance with the Canada Forestry Act 1949 by which the federal government was authorized to provide financial assistance to provincial governments for carrying out certain forestry activities.

3654. FÉVRIER, R. P. Évolution de structure de l'industrie du bois. **[Development of the structure of the timber industry [in Western Europe].]** *Bull. Soc. for. Belg.* 60 (3; 4), 1953 (129–55; 189–205+ 9 photos). [F.]

Discusses trends in consumption and production, price structure, waste, and possible supplementation of native softwoods by tropical hardwoods.

71. MARKETING OF FOREST PRODUCTS: GENERAL

3655. DALE, I. R. **The Uganda timber cess fund.** *Emp. For. Rev.* 32 (1), 1953 (61–2).

A short account of the origin, purpose, and administration of the fund. A proportion of all royalties paid for cutting in state forest is put into the fund, which is administered by a committee including representatives of Uganda Timber Sales Ltd., a selling organization to which all licensees belong. The Committee takes charge of all marketing and carries out research etc., besides providing storage and seasoning facilities.

72. THE QUANTITATIVE ASPECTS OF MARKETING. DEMAND, CONSUMPTION AND SUPPLY

See also Nos. 3810, 4023, 4027.

3656. **Yearbook of forest products statistics 1952.** FAO, Rome. 1952. pp. 172. [E.F.Span.]

Contains new information for 1951 and revised data for 1950, for more than 100 countries.

3657. **European timber trends and prospects: a study prepared jointly by the secretariats of the Food and Agriculture Organization of the United Nations and the United Nations Economic Commission for Europe.** FAO, Geneva. 1953. pp. 315. Price $3·50 or 25*s*.

Deals with production, consumption, international trade, and general trends. There are 214 tables of statistics.

3658. **European timber statistics 1913–1950.** FAO, Geneva. 1953. pp. 30 + 48 tbls. [E.F.] Price $1·75, or 12*s*. 6*d*.

For the first time an attempt has been made to arrive at figures for trade and production in wood and wood products for every European country and to bring them together in convenient form for reference. The war years 1914–19 and 1939–45 have been excluded for lack of adequate statistical data. The volume is divided into 3 sets of tables, dealing respectively with production, trade, and consumption. Within each section a distinction has been made between the various wood products according to the degree of processing to which they have been subjected.

3659. **Timber statistics for Europe, including market reports for January-December, 1951 and 1952.** *Quart. Bull. Timb. Statist. FAO* 5 (4), 1953. pp. 132. [E.F.]

Cf. *For. Abstr.* 10 (No. 2194).

3660. JEWSON, C. B. **A short review of the timber trade with Russia, 1921–1939.** Goose & Son Ltd., Norwich. 1948. pp. vi + 40 + 2 tbls. Price 5*s*.

3661. FRIEDRICH, A. G. Holzimporte der Bundesrepublik Deutschland nach Sortimenten und Herkunftsländern der Jahre 1950 und 1951. **[Wood imports by the Federal German Republic during 1950 and 1951 shown by assortments and countries of origin.]** *Z. Weltforstw.* 15 (6), 1952 (217–25). 12 refs. [G.e.f.]

Figures are derived from official statistics and from data from private forest products enterprises.

3662. MOLTESEN, P. Produktion og oparbejdning av dansk gavntræ fordelt til amter. **[Production and utilization of Danish timber distributed by counties.]** *Repr.* from *Træindustrien* Sept., 1952. pp. [6]. [Dan.] P.R.

Discusses tables showing utilization and production of home-grown timber for 1947–9, distribution by assortment of hardwoods and softwoods and, by county, of softwoods felled in 1947–9, and distribution by counties of hardwoods and softwoods felled and converted for 1947–9, with estimated fellings for 1950–70.

3663. Conjuntura econômica da madeira. **[The present situation in timber economics.]** *An. bras. Econ. flor., Inst. nac. Pinho* 4 (4), 1951 (9–35). [Port.e.]

Discusses the present state of the Brazilian timber industry, and presents statistics for Brazilian exports from 1935 to 1950.

3664. **North Queensland timber industry.** *Aust. Timb. J.* 18 (11), 1952 (901–2).

Extracts from evidence submitted by the North Queensland Sawmillers' Association to the Tariff Board in September, 1952, containing figures for supply, and prices.

73. PRICES

See also No. 3664.

3665. JAMES, N. D. G. **A survey of underwood prices.** *J. Land Agents' Soc.* 52 (6), 1953 (228–42).

Analyses, and tabulates by assortments, prices current in the Midlands and South of England, Dec. 1952–Jan. 1953 for such products as fencing posts, pea and bean sticks, thatching staves, hoop-wood, firewood etc.

78. ECONOMICS OF TRANSPORT

See also Nos. 3453, 3667.

3666. SAVILLE, G. **The transport of timber—1. Some aspects of railway charges. 2. Goods vehicle operation. 3. Conditions of carriage. 4. Aspects of forwarding by rail. 5. Railway wagons and demurrage. 6. Vehicle costs. 7. The Transport Bill.** *Wood* 17 (3–5; 9; 10), 1952 (96–7; 159–60; 190–1; 364–5; 407–8); 18 (1; 3), 1953 (38–9; 120–1).

79. ECONOMICS OF THE WOOD INDUSTRIES

See also Nos. 3776, 3832, 4023.

3667. **Some features of the development in the Finnish forest industry during 1952.** *Pap. ja Puu* 35 (4*a*), 1953 (101 . . . 121). [E.] P.R.

Reviews production and exports and the plant

and equipment of individual firms in the sawmill, timber house, plywood, pulp, spool, paper, board and wallboard industries, in power and steam plants and in transport.

3668. HORDERN, R. H. **The technology of wood costing—1. Prime factors in costing and estimating. 2. Separation of machine costing. 3. Limitations to establishment charges. 4. Costing individual operations. 5. Machine-hour costing. 6. Machines for structural woodwork. 7. Machine lay-out in relation to costs. 8. Applied costs and production value. 9. The effect of transition from hand to machine. 10 and 11. Portable power tools.** *Wood* 16 (11; 12), 1951 (438–40; 476–8); 17 (1–9), 1952 (28–30; 70–2; 110–2; 152–5; 197–9; 240–2; 278–81; 318–20; 356–7).

8. FOREST PRODUCTS AND THEIR UTILIZATION

3669. ***Beech Utilization Series.*** The Northeastern Technical Committee on the Utilization of Beech in co-operation with the Northeastern Forest Experiment Station, Upper Darby, Pa.

The first report, published in October 1951, is one of a series in which it is hoped to assemble and publish the available information on the utilization of *Fagus grandifolia*. A list of over 20 proposed titles is given. Abbreviation in *For. Abstr.: Beech Utiliz. Ser. Ntheast. For. Exp. Sta.*

3670. **Sixth Forest Products Research Conference.** *Aust. Timb. J.* 18 (12), 1953 (948, 950).

Subjects discussed at the Conference, held at Melbourne in Nov. 1952, included preservation of railway sleepers, vapour drying of Australian timbers, the use of glued laminated structures, and uses of bark. Good results have been obtained experimentally in vapour-drying of 'Ash' Eucalypts and *Pinus radiata*. Barks of Stringybark [*Eucalyptus* spp.] are successfully used in the manufacture of fibrous plaster sheets. The bark of *Melaleuca leucadendron* is being exploited as a source of cork.

81. WOOD AND BARK: STRUCTURE AND PROPERTIES

810. *General Information on Woods*

See also Nos. 3084, 3139, 3145, 3223, 3615, 3688, 4021.

3671. SUVARNASUDDHI, K. **Some commercial timbers of Thailand: their properties and uses.** Royal Forest Department, Bangkok. 1950. pp. 52.

Describes some 30 species with notes on habit of tree and its distribution, characteristics of the wood, sp. gr., seasoning, durability, working properties, uses and supplies.

3672. SAMAPUDHI, K. **[The grouping of timber names.]** *Vanasarn* 10 (2), 1952 (36–40). [Siam.]

Suggestions for a grouping of Siamese exploitable timbers, following a visit to Kepong.

3673. THOMAS, A. V. **Malayan timbers.** *Malay. Forester* 16 (2), 1953 (103–7).

Notes on the properties of Chengal (*Balanocarpus heimii*) and Balau (*Shorea* spp.).

3674. **Trees and timbers of Sarawak and Brunei.** *Leafl. For. Dep. Sarawak* Nos. 1–4, [1953]. pp. 9; 4; 1; 4.

(1) Distribution, silvicultural characters, wood, and uses (including latex) of *Dyera costulata, D. lowii, Alstonia spathulata, A. angustiloba, A. angustifolia*, and *Cerbera manghas*.

(2) Distribution, silvicultural characters, wood, and uses (including that of sap as poison, and sap of *Melanorrhoea* in lacquer), of *Campnosperma, Melanorrhoea* and *Gluta* spp.

(3) Describes the tree and wood of *Cantleya corniculata*.

(4) Silvicultural characters, wood properties and uses of *Dillenia* spp.

3675. NOLDE, I. VON. Die wichtigsten Holzarten des Monsunwaldes Kolumbiens. **[The most important species of Colombia's monsoon forests.]** *Z. Weltforstwirt.* 16 (1–2), 1953 (36–7; 72–3). [G.]

Describes the tree and the wood, with notes on distribution, trade names and uses, of *Tecoma peroba, Vitex columbiensis, Pithecellobium dulce, Prosopis juliflora, Anacardium excelsum, Cariniana pyriformis, Castilloa elastica, Cedrela* sp.; *Centrolobium* sp., *Chlorophora tinctoria, Copaifera officinalis, Cordia alliodora, Dialium divaricatum, Lecythis ollaria, L. curranii, Myroxylon toluiferum, Protium guianense, Swietenia macrophylla* and *Licania arborea*. [Cf. *For. Abstr.* 13 (Nos. 3281–2).]

3676. GERRY, E. **Information leaflet. Foreign woods.** *Rep. U.S. For. Prod. Lab., Madison* Nos. *R*1920, 1952, pp. 9, 35 refs.; *R*1921, 1952, pp. 5, 12 refs.; *R*1924, 1952, pp. 5, 15 refs. P.R.

(*R*1920): Apitong, Bagac, Eng, Gurjun, Yang (*Dipterocarpus* spp.).

(R1921): Albarço, Bacú (*Cariniana pyriformis*).

(*R*1924): Imbuia, Embuia or 'Brazilian Walnut' (*Phoebe porosa*).

3677. **Specimen woods Nos. 207–10.** *Suppls.* to *Wood* 18 (3–6), 1953 (103–4; 143–4; 183–4; 223–4).

Blackbutt (*Eucalyptus pilularis*); Ironbark (narrow-leaved) (*E. crebra*); Kurokai (*Protium decandrum*); and Mengkulang (*Tarrietia* spp.).

3678. **Timbers of New South Wales: Narrow-leaved Red Ironbark [*Eucalyptus crebra*].** *Tech. Notes For. Comm. (Div. Wood Technol.) N.S.W.* 6 (1/2), 1953 (2–5).

Includes notes on distribution, a brief botanical description, a description of the timber and details of properties and uses.

3679. SAMPAIO, A. NAVARRO. Aplicações da madeira de eucalipto. **[Uses of Eucalypt timber.]** *An. bras. Econ. flor., Inst. nac. Pinho* 4 (4), 1951 (79–94). [Port.]

Presents data on the suitability of *Eucalyptus* spp. for fuel, charcoal, fence posts (including preservative treatment), piles, sleepers, civil engineering, cabinet-making, pulping, and essential oil and tannin extraction.

811. *Structure, Identification*

3680. Levy, J. F. **A method of embedding brittle specimens of wood [in polyvinyl lactophenol] for sectioning.** *Nature, Lond.* 171 (4361), 1953 (984).

3681. Kisser, J., and Jünger, E. Mikroskopische Zellwanddeformierungen von Holzelementen bei der Schnittanfertigung. **[Microscopic cell-wall deformation of wood elements occurring during the cutting of sections.]** *Repr.* from *Mikroskopie, Wien* 7 (7/8), 1952 (272–83). 16 refs. [G.g.e.] X.

3682. Bruyne, A. S. de. **Wood structure and age.** *Proc. ned. Akad. Wet.* 55*C* (3), 1952 (282–6 + 4 photos). 6 refs. [E.e.] [Laboratorium voor Algemene Plantkunde, Wageningen.] O.R.S.

Stresses the need to base a description of wood on discs or wedge-shaped blocks including the centre of the tree and large enough to ensure the presence of mature wood. The main description should be of the mature stage but immature and transitional stages should also be briefly described. Variations in ray structure of *Pterospermum diversifolium* with distance from the core are illustrated with photomicrographs. The age of the wood for each stage, where growth rings are clearly demarcated, is best indicated by the number of growth rings, but for comparison with wood grown in different conditions or samples where growth rings are indistinct, distance from the core in cm. should also be given. Ontogenetic development can be used in identification and an example is given showing that *P. diversifolium* and *P. javanicum* (closely related species), can be distinguished by the pore diameter at different stages of development in ray structure.

3683. Metcalfe, C. R. **The anatomical approach to the classification of the flowering plants.** *Science Progress, London* 41 (161), 1953 (42–53). 21 refs. O.R.S.

Quotes examples, mainly from studies on wood structure, showing the value of the anatomical in combination with the taxonomic approach in classification.

3684. Johnston, D. R. **Structure drawings to 'Specimen Woods', Sheets 21–4.** *Wood* 18 (3–6), 1953 (105; 145; 182; 222).

(21) Hickory (*Carya* spp.), Gaboon (*Aucoumea klaineana*), Freijo (*Cordia goeldiana*) and Purpleheart (*Peltogyne* spp.); (22) Cherry (*Prunus avium*), Jackwood (*Artocarpus integrifolia*), Karri (*Eucalyptus diversicolor*) and Western Hemlock (*Tsuga heterophylla*); (23) Kokko (*Albizzia lebbek*), Borneo Camphorwood (*Dryobalanops aromatica*), Parana Pine (*Araucaria angustifolia*) and South American Cedar (*Cedrela odorata*); (24) Red Quaruba (*Vochysia* spp.), Red Jequitiba (*Cariniana* sp.), Red Louro (*Ocotea rubra*) and Mandio (*Qualea* spp.).

3685. Greguss, P. Die Xylotomie der Araukariaceen. **[The wood anatomy of the Araucariaceae.]** *Acta biol., Budapest* 3 (4), 1952 (443–541). 30 refs. [G.russ.] O.R.S.

Part of the author's work, *Xylotomie der Koniferen*, still in preparation. Thirteen *Araucaria* and 10 *Agathis* spp. are described and illustrated by drawings and photomicrographs of the different wood sections. [Cf. *For. Abstr.* 14 (No. 2601).]

3686. Zalewska, Z. Budowa anatomiczna drewna *Metasequoia glyptostroboides* Hu et Cheng. **[Anatomical structure of the wood of *M. glyptostroboides*.]** *Roczn. dendrol. polsk. Tow. bot., Warsz.* 8, 1952 (98–112). 7 refs. [Pol.pol.russ.e.]

According to the author's investigations and those of Li, Yu, and Greguss, the structure of the wood resembles that of *Taxodium* and *Sequoia* in that (1) the bordered pits in the early wood are arranged in 1–3 opposite rows, (2) radial-wall ray pits are mostly *Taxodium*-like, and (3) bordered pits are always present on the tangential walls in the early- and late-wood tracheids. The characteristic features of *M. glyptostroboides* are: low ray cells, with the pits on their radial walls arranged in only one horizontal row.

3687. Cozzo, D. **The structure and diagnostic significance of crateriform bordered pits in the vessels of *Cercidium*.** *J. Arnold Arbor.* 34 (2), 1953 (187–90). 5 refs.

3688. Almeida, D. Guilherme de. ***Dalbergia frutescens* (Vell) Britton, 'Sebastião de Arruda'.** *Arq. Serv. flor., Brasil* 5, 1951 (15–34). [Port.port.e.f.]

The exact identity of Rosewood, Brazilian Tulipwood or Sebastião de Arruda has hitherto been doubtful. The results are presented of a study of the botanical and anatomical characteristics of a specimen that has been identified as *D. frutescens*. Some data on physical properties are also given.

3689. Paddon, T. W. Les nouveaux hêtres du Chili. **[The *Nothofagus* species of Chile.]** *Rev. Bois Appl.* 8 (5), 1953 (9–11). 1 ref. [F.]

A brief description of the distribution of 6 *Nothofagus* species, and wood structure of *N. antarctica*, *N. betuloides*, and *N. pumilio*.

3690. Duvigneaud, P., Staquet, J., and Dewit, J. Contribution à l'étude anatomique des rameaux chez les sections africaines du genre *Strychnos*. **[An anatomical study of the branches in the African sections of the genus *Strychnos*.]** *Bull. Soc. Bot. Belg.* 85 (1), 1952 (39–67). 12 refs. [F.] O.B.D.

A preliminary study with the object of establishing possible connexions between anatomy and taxonomy.

3691. Wałek-Czernecka, A. Anatomia porównawcza drewna *Populus alba* L., *Populus tremula* L., *Populus canescens* Sm. **[Comparative wood anatomy of *P. alba*, *P. tremula*, and *P. canescens*.]** *Roczn. dendrol. polsk. Tow. bot., Warsz.* 8, 1952 (1–31). 21 refs. [Pol.russ.f.]

Results are presented of an investigation of specimens cut from 30-year-old trees at 4·3 m. With regard to wood properties, *P. canescens* (I) falls between *P. alba* (II) and *P. tremula* (III). It is similar to (II) in the following features: % composition of wood, arrangement of vessels, number of vessels per sq. mm., size of the maximum vessel sections; it more resembles (III) in the following respects: distribution and nature of fibres, their diameters, and the large proportion of short rays. Characteristic features of (I) are: relatively more

numerous rays, and larger ray cells. As pulpwood, (I) should not be inferior to either (II) or (III).

3692. Duchaigne, A., and Chalard, A. du Contribution à l'étude du *Polyosma aulacocarpa* Gagnepain. (Nouvelle Saxifragacée indochinoise.) **[Contribution to the study of *P. aulacocarpa* (a new Saxifragaceae from Indo-China).]** *Bull. Soc. bot. France* 99 (7/9), 1952 (278–81). [F.] O.B.D.

A study of the anatomy of the stem.

811.1. Anatomical Elements and Tissues

See also Nos. 3071, 3191–2, 3490, 3682, 3687, 3752.

3693. Vihrov, V. E., and Perelygin, L. M. O formirovanii drevesiny duba. **[The formation of wood in Oak.]** *Trud. Inst. Les.* No. 4, 1949 (91–7). [Russ.]

Presents results of an investigation on the wood of two 10-year-old Oaks (*Quercus robur*): the first (I) was 2·92 m. high and had a diameter of 2·5 cm. (2·2 cm. u.b.) at a height of 3 cm. above ground; corresponding figures for the second (II) being 2·35 m. and 1·1 cm. (1·0 cm. u.b.), respectively. The wood was sapwood throughout, white with a pale-cream tinge. At a height of 3 cm., the average growth-ring width was 1·1 mm. in (I), and 0·55 mm. in (II). Seventeen sections were photomicrographed (levels 3·6–3·8, 120, and 160 cm.). A continuous ring of large vessels appeared in the upper part of the stem only in the 5–6th year, but was absent in the lower part even after 10 years. During the first few years of life, only narrow uniseriate rays extend from the pith, the wider rays being formed later. A large amount of wood parenchyma can be observed, grouped in continuous tangential rows. The relationship between vessel diameter and vessel position along the radius is graphed and tabulated for both stems for two heights.

3694. Preston, R. D. **The molecular architecture of plant cell walls.** Chapman & Hall, London. 1952. pp. xii + 211 + 32 photos. P.R.

Includes sections on: form of the plant cell; chemical nature of the constituents of the secondary wall; physical methods for the investigation of structure in plant cell walls; structural features of cellulose and the spatial relationships of the incrusting substances; wall structure in thick cell walls; structural variations in homologous cells; primary wall of growing cells, and mechanisms of orientation and growth.

3695. Volz, G. Elektronenmikroskopische Untersuchungen über die Porengrössen pflanzlicher Zellwände. **[Research with the electron microscope into the pore size of plant cell walls.]** *Repr.* from *Mikroskopie, Wien* 7 (7/8), 1952 (251–66). 48 refs. [G.g.e.] X.

Examination of very thin sections under the electron microscope reveals holes and thin areas in the cell wall that are invisible under the ordinary microscope. Specimens of the phloem of a number of angiosperms and gymnosperms were examined, and the number, arrangement, and size of the holes and thin areas were clearly seen. It was possible to distinguish clearly between the diameter of the holes in the longitudinal walls (sieve fields) and in the transverse walls (sieve plates), and between the sieve tubes of early and late phloem. In the gymnosperms, and also in some angiosperms, a fine membrane closes the holes of the sieve pits and the sieve fields. The physiological significance of this discovery is discussed. Outside the sieve fields proper are to be found plasmodesma holes, invisible under the ordinary microscope, of a diameter of 0·02μ, displaying 'closed construction'.

3696. Kisser, J., and Wittmann, W. Fluoreszenzmikroskopische Untersuchungen an verholzten Zellwänden. **[The study of lignified cell walls by fluorescence microscopy.]** *Repr.* from *Mikrochemie, Wien* 36/37, 1951 (1134–45). 23 refs. [G.g.f.e.]. X.

A study was made to determine whether the primary blue fluorescence of the lignified cell wall could be used as a test reaction for lignification. It was found, however, that the blue fluorescence could be made to disappear by exhaustive extraction with hot water and also by treatment with a weak oxidizing agent, though the lignin content of the membrance was little changed. It is probable that the blue fluorescence is conditioned by the water-soluble lignins present.

3697. Bannan, M. W. **Further observations on the reduction of fusiform cambial cells in *Thuja occidentalis* L.** *Canad. J. Bot.* 31 (1), 1953 (63–74). 6 refs. O.R.S.

The multiplication of fusiform initials in the cambium is accompanied by extensive loss or transformation of these cells. A few of the failing cambial cells lapse into maturation quickly, but the majority are transversely subdivided with varying proportions of the segments surviving and undergoing ultimate conversion to ray initials. The loss or conversion is attended with reduction in cell size. Increase in cell volume lags behind cell division during the periclinal divisions of the transitional period. The tangential dimensions of the successively formed cells are continuously reduced, and sometimes radial expansion is also retarded especially toward the cell tips. Simultaneous shortening of the cells is due to alteration in cell shape combined with asymmetry in periclinal division such that daughter cells of unequal lengths are produced. Repetition of the process, the smaller cell functioning as the initiating cambial cell in each instance, results in continued shortening. [Cf. *For. Abstr.* 13 (No. 608).] *Author's summary.*

3698. Linnemann, G. Untersuchungen über den Markstrahlanteil am Holz der Buche. **[The proportion of ray tissue in Beech wood.]** *Ber. dtsch. bot. Ges.* 66 (1), 1953 (37–63). 17 refs. [G.g.] O.B.D.

Specimens were investigated from the stem and branches of *Fagus sylvatica*, *F. sylvatica* var. *purpurea* and *F. orientalis*. The proportion of ray tissue to the rest of the tissue varies from ring to ring in the same individual, and from tree to tree in the same year's growth. Wide rays are usually broader in the late than in the early wood, and they are broader towards the bark. The % of wide rays to other tissue showed more variation than that of the narrow rays. The comparatively high number of rays per

unit length of the circumference of the inner annual rings, and a decline (at first rapid, and then gradual) towards the bark, were clearly shown in the branches. The number of rays was higher in the branches than in the stem, except in the case of a 38-year-old *F. sylvatica* var. *purpurea*. In general, however, the proportion of ray tissue in the wood of *F. sylvatica* varies only very slightly.

811.4. Growth Rings. Early and Late Wood

See Nos. 3338, 3693.

811.5. Sapwood and Heartwood

3699. Paclt, J. Kernbildung der Buche (*Fagus silvatica* L.). [**Heartwood formation in Beech.**] *Phytopath. Z.* 20 (3), 1953 (255–9). 9 refs. [G.] [Institut für Holzforschung, Bratislava.] O.R.S.

The author discusses literature on heartwood formation in Beech and restates his theory that conditions for its formation are abnormal penetration of air through two wound centres, one in the branches and the other in or near the root system. The progress of heartwood formation is as follows: original impulse (generally non-specific: lack of light in the stand, frost, mechanical damage); specific impulse, wounding; localization—crown and root; abnormal diffusion of air through the stem, necrosis of wound; and formation of tyloses and oxidation of tannin complexes as the defence mechanism of the tree. Photographs are given showing the presence of false heartwood in Beech roots.

811.6. Texture. Grain. Figure

See also No. 3924.

3700. Baumer, M. **Figure in wood.** *Wood* 18 (5; 6), 1953 (178–81; 212–5). Transl. by J. L. Robertson from *Bois For. Trop.* No. 24, 1952 (233–55). [See *For. Abstr.* 14 (No. 1500).]

811.7. *Phloem. Bark*

3701. Dumanskiĭ, A. V., and Išlinskiĭ, A. Ju. O zakonomernostjah rastreskivanija kory derevjev. [**Regularities in the fissuring of tree bark.**] *Dokl. Akad. Nauk SSSR* 84 (1), 1952 (161–4). 2 refs. [Russ.] A.P.B.

Previous work on the cracking patterns obtained by drying or mechanically stressing various coatings applied to solid surfaces had shown that the dimensions of the 'cells' formed is dependent upon the adhesive force between the particles and the elasticity of the system. As a similar result might be expected for a coating on an expanding cylinder, experiments were made with a bicycle inner tube to which thin paper or a layer of chalk was fixed with an adhesive. Photographs are given of the crack patterns obtained after inflating the tube: that produced in the paper coating—a fibrous material—greatly resembled that of tree bark. The width of the units formed by cracking in tree bark (from centre to centre of the fissures) was measured on adult trees of various species, 50–97 cm. in diam., at 117–120 cm. up the stem. [No further details are given of population and procedure in measurement or analysis.] The rule of equal size of such units was found to be true not only for the individual tree, but also for all trees of a given species growing under identical site conditions [and of the same age]; but the distance between fissures increased with increasing age of tree. In trees of equal diameter, width of the units depended on species, the averages actually found being: Maple 2·4, Lime 4·8, Ash 4·9, Oak 5·4, White Poplar 6·8, and Scots Pine 7·8 cm. Presumably the elasticity of the bark tissues varies in the same order. The remainder of the paper is devoted to a mathematical analysis of the mechanics of the formation of units of definite length, taking as a model the stretching of an elastic strip to which a brittle coating has been attached of a material such as clay.

812. *Physical and Mechanical Properties*

See also Nos. 3688, 3805, 3923.

3702. Limaye, V. D. **Standard terminology for describing timbers.** *Indian For.* 79 (2), 1953 (77–86).

Taking Teak as the standard, the physical and mechanical properties of some 100 other Indian timbers are compared with it by index figures already published [cf. *For Abstr.* 13 (No. 2419)]. The species considered are classified according to their weight, strength as beams, hardness, impact resistance, and stability. Five species are described as an example of the use of the proposed terminology: e.g. '*Cedrus deodara* is a moderately heavy (35), moderately strong (80), moderately hard (70), steady (85) and straight-grained timber'.

3703. Características físicas e mecánicas de madeiras do Rio Grande do Sul. [**Physical and mechanical properties of timbers of Rio Grande do Sul.**] *An. bras. Econ. flor., Inst. nac. Pinho* 4 (4), 1951 (202–12). [Port.e.]

Presents the findings of the Instituto Tecnológico do Estado do Rio Grande do Sul on the following: *Piptadenia rigida*, *Eugenia* sp., *Cupania vernalis*, *Cabralea oblongifolia*, *Roupala heterophylla*, *Patagonula americana*, *Phoebe porosa*, *Araucaria angustifolia* and *Grevillea robusta*.

812.1. Optical, Acoustic, Frictional, Thermal and Electrical Properties

3704. Kenworthy, R. W., and Burnam, T. D. **The absorption coefficients of Fir plywood panels.** *Journal of the Acoustical Society of America, Lancaster, Pa.* 23 (5), 1951 (531–2). 1 ref. P.O.

The absorption coefficients of flat, splayed, and cylindrical panel assemblies made from $\frac{1}{4}$-in. 3-ply wood have been measured by the reverberation-chamber method under 3 different conditions. All panels have greater absorption at the lower frequencies (128 and 256) than at higher frequencies. The effective absorption of each type can be increased by using a $\frac{1}{2}$-in. kapok felt in combination with it, either mounted on the wall behind the panel or spot-cemented to the plywood. Each type of panel has desirable characteristics under certain conditions. The absorption of all types indicates that such panels are important acoustical materials in the lower frequency range. *Authors' summary.*

3705. Parkin, P. H., and Purkis, H. J. **Sound absorption of wood panels for the Royal Festival Hall.** *Repr.* from *Acustica, Zürich* 2, 1951 (81–2). 2 refs. [E.e.f.g.] P.R.

The coefficients of sound absorption of the wood panels to be used for low-frequency absorption in the Royal Festival Hall, London, have been measured over the range of 50–500 cycles./sec., using the reverberation-chamber technique. Variations consisting in different air-spaces and different amount of cross-bracing were sufficient to vary the absorption coefficients obtained over the range 50–100 cycles/sec.; at higher frequencies the absorption coefficients of all types of panels were practically the same. *From authors' summary.*

3706. Gilles, F. Le bois et le feu. **[Wood and fire.]** *Rev. Bois. Appl.* 8 (3), 1953 (20–5). 1 ref. [F.]

Discusses the classification of materials with regard to their behaviour in fire according to the French decree of 1949 and the findings of a special Commission for testing structural materials. Incombustible materials are those which, at 1200° C., do not combine with atmospheric O_2 with evolution of heat. The following substances are just on the 'threshold of combustibility' (otherwise called non-inflammable, and yielding not more than 500 cal./g.): cement with 14% of wood fibres, or asbestos with 10% cotton. Some characteristics of inflammability are discussed. The behaviour of wood at different temperatures is described, and the following important factors are stressed: surface condition of wood, its mode of use, and the source of heat.

3707. Jentzsch, H. Die Bestimmung der Entzündungs- und Brenneigenschaften des Holzes und anderer Stoffe mit Hilfe des Zündwertverfahrens. **[Determination of the ignition and combustion properties of wood and other substances, using the author's ignition method.]** *Holz Roh- u. Werkstoff* 10 (10), 1952 (385–90). 22 refs. [G.g.] P.R.

Stresses the applicability of the author's ignition tester not only to the evaluation of fuels but also to woods and fire retardants. Quotes figures published by L. Metz (*Holzschutz gegen Feuer*, 2nd ed., Berlin, 1942) relating to Elm, Ash, Hornbeam, Beech, Fir, Alder, Red Pine (sapwood), Scots Pine, Spruce, Oak, and Teak woods, and gives, in tables and graphs, the results of the author's own tests on German Elm, Poplar, Hornbeam, Pine, Spruce and Oak. The samples were either fine wood flour or dice of 9 mm. edge. The following figures were obtained for the 6 species: flash point 235, 235, 245, 240, 240, 245°C.; fire point 280, 270, 280, 270, 280, 280°; self-ignition point (temperature at which the material ignites in a current of O) 250, 250, 270, 290, 290, 280°; upper ignition value (temperature at which the material ignites without O) 330 (450), 330 (450), 345 (470), 390 (480), 390 (480), 490 (510), the first and second (bracketed) figures referring respectively to finely comminuted and to diced material. A graph shows a high degree of correlation between ignition delay as determined in the author's tester (Metz, *loc. cit.*), and maximum combustion rate (Truax and Harrison), when both magnitudes are plotted against timber density. A table is included, grouping different materials (from cine-films, CS_2, and Cedar wood at the one end, to uncoated non-combustible objects at the other) according to their combustibility (upper ignition value below 400°, 400–500°, 500–550°, over 550°, and non-combustible) and ignitability (fire point below 200°, 200–300°, over 300°, and no fire point). Giving both series numbers, Cedar wood belongs to 1·1; Poplar, Elm, and Beech woods to 1·2, Oak and Teak to 2·2; and wood well fire-proofed to group 4·3.

3708. Rubens, E. Estudio sobre las combustibilidades de las maderas chilenas. **[The combustibility of Chilean timbers.]** *Scientia, Valparaíso* 18 (2), 1951 (67–72). 8 refs. [Span.] L.S.

Some of the most important Chilean timbers were tested according to a standard issued by the American Society for Testing Materials, and their relative combustibility was assessed by means of the following formula: relative combustibility

$$= \frac{\text{maximum temperature (° C.)}}{\text{residue (\%)} \times \text{time of burning (min.)}}.$$

Values are presented for 12 species. *Aextoxicon punctatum*, *Laurelia serrata*, *L. sempervirens*, and *L. aromatica* had the highest values, and *Myrtus luma*, *Persea lingue* and *Nothofagus procera* the lowest.

812.2. Behaviour with Liquids and Gases. Moisture Relations etc.

See also Nos. 3719, 3771, 3822, 3853–4, 3908 *et seq.*

3709. Hefferline, J. E. **Continuous moisture detection in lumber.** *J. For. Prod. Res. Soc.* 2 (5), 1952 (225–7). P.R.

Describes an instrument, now in the development stage, designed for observing moisture content in lumber and plywood.

3710. Ramaswamy, M. N., Varadaraj, S. K., and Gowda, D. R. **The moisture content of Sandalwood.** *Indian For.* 79 (4), 1953 (234–6 + 4 gphs.). 2 refs.

The moisture content of *Santalum album* was determined by oven drying and by distillation and the content of volatile oils by alcohol extraction. Estimation of m.c. by oven-drying gave values about 3% too high because of the loss of volatile constituents as well as moisture from the wood. The weight of the wood, especially in the form of chips, varied with the relative humidity of the air. The range of variation for heartwood was 2·39% of the initial weight; that of sapwood was 5·37% over a period of 6 weeks. The atmosphere in a shed stored with 'roughwood' (pieces consisting of the heartwood with a layer of not more than 1 in. of sapwood) was cooler and considerably more humid than that in a room without wood. Results are given in graphs.

3711. Millett, R. S. **Variation in moisture content in wood exposed to indoor conditions.** *Timber of Canada* 13 (7), 1953 (21–3, 34, 36).

Seasoned samples from 6 softwood and 5 hardwood species, after storage to moisture equilibrium indoors, were placed in positions known to have the lowest relative humidity in winter and the highest in summer in the Forest Products Laboratory, Ottawa, and weighed at weekly intervals over 2 years. The

highest, lowest and mean of monthly average moisture content, and equilibrium m.c. by species, are shown in graphs. With the exception of Basswood, which gave lower m.c. values than the other species, there was little difference between individual species and between hardwoods and softwoods; Sugar Maple and White Spruce showed the greatest seasonal variation in m.c. (5·8 and 5·7% respectively) and Basswood and Red Pine the least (4·4 and 5·1%). Summer m.c. ranged from 10·2% for White Spruce to 9·4% for Yellow Birch and 7·9% for Basswood, and winter m.c. from 4·6% for Balsam Fir and Red Pine to 4·0% for Beech and 3·5% for Basswood. The average yearly m.c. of all species excluding Basswood was 7·3% and drying to a m.c. of 6% (5% for Basswood) is recommended for wood for general indoor use in heated buildings. Tabulated figures are given showing the maximum seasonal variations in m.c. of the species studied, tangential shrinkage when drying from green to oven-dry, and their calculated change in dimension during maximum variation in m.c.

3712. **Shrinking and swelling of wood in use.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*736 (rev.) 1952. pp. 10 + 1 dgm. + 2 tbls. + 1 map. 10 refs. P.R.

A general account of shrinkage, its variability, and some effects of shrinkage and swelling, is followed by instructions aiming at minimizing shrinkage and swelling during and after manufacture. A table showing shrinkage values of some 40 softwoods and 90 hardwoods, and a table with recommended moisture content for various wood items at the time of installation (under climatic conditions of different parts of the U.S.A.) are appended. [Cf. *For. Abstr.* 4 (p. 33).]

3713. **Dead log studies.** *Rep. For. Dep. W. Aust. 1951/52*, 1952 (12).

A series of trials carried out some time ago to determine the moisture content and drying rate of timber from 'dead logs' of Jarrah [*Eucalyptus marginata*] showed that it was incorrect to speak of dead logs as dry logs. Some timber operators, however, held that timber from dead logs shrinks less after cutting than that from green trees. An investigation was therefore made to examine the comparative shrinkage in timber from: (1) dead fallen logs, (2) old dead standing trees, (3) recently dead standing trees, and (4) green trees. In general the results (tabulated) showed that over the same moisture-content range, the behaviour is similar in all types of timber; that is, the shrinkage of timber from dead trees is generally in conformity with that of timber from green trees.

3714. KADITA, S., NAKATO, K., and YAMADA, T. **[The cause of anisotropic shrinkage and swelling of wood. Part I. Previous theories and their criticism. Part II. Relationship between anisotropy and the macroscopic or microscopic structure of wood. Part III. The anisotropic deformation of Hinoki (*Chamaecyparis obtusa*).]** *Trans. 59th Mtg. Jap. For. Soc.* 1951 (217–22). 55 refs. [Jap.e.]

Parts I and II deal with the theory of the anisotropic deformation of wood; the annual rings, the orientation of both cell and fibril, and the thickness of the central layer [of secondary wall] all being taken into account in the theory of fibril orientation. Experiments on models have shown the need for determining various magnitudes (e.g. difference between deformation forces in the surface and inner layers; volume ratio of the constituent layers); result of tests on models representing the double cell wall, or cells idealized as prismatic tubes, do not appear to be related to anisotropic deformation. In Part II, results of tests on the swelling of *C. obtusa* are presented.

3715. SCHWARTZ, W. Beiträge zur Kenntnis des Holzes als Werkstoff, III. Untersuchungen über die Beeinflussung der Quellung des Holzes durch Imprägnierung. **[Contributions to knowledge of wood as an industrial material, III. The effects of impregnation on the swelling of wood.]** *Angew. Bot.* 26 (5), 1952 (228–39). 4 refs. [G.g.] E.M.B.

Thin sections of Birch, Beech, Gaboon and Spruce were tested for swelling in a humid atmosphere after treatment with various chemical compounds. Swelling increased after treatment with LiCl and Na_2CO_3 solutions but was reduced by $CaCl_2$ and $Ca(HCO_3)_2$. Simple phenol derivatives have a varying effect on swelling, but the introduction of alkyl residues or Cl increases the inhibition of swelling. Rinsing in water after treatment with phenyl salicylate, guaiacol, xylenol, cinnamic acid and phenol carboxylic acid shows that the inhibition of swelling is reduced by washing, but is not eliminated. When pressure was applied during impregnation with tannin, phenol, cresol, guaiacol, xylenol, thymol, trichlorophenol and other compounds, the protective effect was increased. Best results of this kind were obtained with *m*-xylenol, menthol, guaiacol, thymol, *o*-cresol, *p*-chlorophenol, trichlorophenol, and *p*-cresol. Tests with sections from which (*a*) lignin, and (*b*) cellulose had been removed showed that both the cellulose and the lignin are involved in the swelling process.

3716. STAMM, A. J. **Diffusion and penetration mechanism of liquids into wood.** *Pulp Paper Mag. Can.* 54 (2), 1953 (54–63). 34 refs.

Literature on the passage of gases, vapours, liquids and dissolved materials through wood is reviewed and data on the mechanism of penetration of pulping liquors into chips or blocks with chip lengths are considered. Measurements were made of water absorption by Sitka Spruce heartwood blocks. Results show that the rate of natural penetration of water into wood in the fibre direction at different temperatures, varies with the vapour pressure of the water and the inward diffusion of the vapour. The possibilities of capillary rise controlling the rate are ruled out by the fact that changes of rate with changes of temperature do not correlate with the surface tension divided by the viscosity (the capillary rise constant). Calculations show that diffusion is responsible for only about 14% of the uptake of water, but nevertheless controls the rate of absorption. The rate of swelling closely follows the rate of absorption. Both swelling and absorption rates are greatly increased by evacuating the air from the wood, thus increasing the rate of diffusion of water vapour into the wood and avoiding the

retarding effect of back pressure by the air. Steaming of wet wood increases the rate of absorption considerably over mere soaking. Pre-penetration of dry wood with NH_3 increases the rate of absorption almost to that obtained by evacuation, and the method may have possibilities as a rapid means of impregnating dry chips with cooking liquor during pulping.

3717. Suzuki, Y. **[Studies on the Bamboo (VII). The blocking of pit pores in the parenchyma cells of Bamboo, and its effect on the permeation of liquids and gas into Bamboo.]** *Bull. Tokyo Univ. For.* No. 43, 1952 (151–7). [Jap.e.]

[Cf. *For. Abstr.* 13 (Nos. 622–3).] The permeation of air and several liquids into dried strips of *Phyllostachys pubescens* was studied. Measurement of the quantity of air flowing from the specimen when the pressure of the surrounding air was reduced, showed that about 70% of the void space is closed against the surrounding air and is unaffected by changes in its pressure. Similar results were obtained when CCl_4 was introduced into the strip, only about 30% of the void space being filled. This abnormal impermeability is believed to be caused by blockage of the pores of the parenchyma cells with the cell sap, dried by the removal of water. Air and liquids that cannot dissolve the dried sap cannot permeate into the cell cavity, while water dissolving the cell sap permeates readily. It is therefore concluded that exhausting the air from dried Bamboo during preservative treatment is useless as regards the parenchyma cell, and that the comparative ease of impregnation is related to the solubility of the dried sap in the liquid concerned.

812.3. Density. Specific Gravity. Buoyancy

See also Nos. 3448, 3721, 3771.

3718. Wilson, M. E. **Weights of indigenous timbers.** *For. Prod. Res. Notes N.Z. For. Serv.* 1 (4), 1952 (18–21 + 1 dgm. + 1 tbl.).

Tabulates figures showing mean weight/cu. ft., standard deviation, and 95% probability range for 25 indigenous timbers, green and at 50% and 12% moisture contents, and gives a diagram showing the mean and 95% probability range at 50% and 12% m.c.

812.7. Strength Properties

See also Nos. 3788, 3808, 3822.

3719. Meredith, R. [Editor]. **Mechanical properties of wood and paper.** North-Holland Publishing Company, Amsterdam. 1953. pp. 298 + 1 dgm. 8 pp. of refs. [E.] Price *Fl.* 25 (£3. 4*s.*).

The work consists of two parts: (I) The mechanical properties of wood and their relation to water, by *W. W. Barkas*, with one chapter by *R. F. S. Hearmon*, contains an introduction (historical, the theory and measurement of elasticity of wood, gels and swelling stresses, anatomical and molecular structure, development of the wood, the model cell, and cell-wall constitution), and chapters on: elastic and plastic properties; hygroscopicity, swelling and shrinking; osmotic pressure and swelling stresses; and plastic swelling and sorption hysteresis. (II) The mechanical properties of paper, by *H. F. Rance.*

3720. **Strength values of clear wood and related factors.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1903–10, 1952. pp. 24 + 4 photos + 3 dgms. + 5 tbls. 19 refs. P.R.

Table 1 gives values for density, static bending, impact bending, compression parallel and perpendicular to grain, shear parallel to grain, tension perpendicular to grain, and hardness, for wood of 39 common American broadleaved, and 35 coniferous species, both in green and air-dry condition, the properties being determined for 2 × 2 in. or smaller clear specimens in accordance with the standard A.S.T.M. procedures. Table 2 gives different elastic constants of 11 species. Table 3 gives the average toughness values for 32 species. Table 4 gives the density/strength relations for woods of different species, and Table 5 the strength of wood members with various grain slopes versus members with straight grain.

3721. Tack, C. H. **A note on the mechanical properties of *Chrysophyllum albidum* and *Albizzia zygia* from Uganda.** *Tech. Note For. Dep. Uganda* No. 1/53, [1953]. pp. 4.

Weight (at 50 and 12% moisture content), static bending, impact bending, compression parallel to grain, hardness, and cleavage test results are tabulated.

3722. Ivanov, Ju. M. Novaja harakteristika pročnosti drevesiny i metody ee opredelenija. **[A new characteristic of wood strength, and methods for its determination.]** *Trud. Inst. Les.* No. 4, 1949 (34–45). 4 refs. [Russ.]

Introduces a new characteristic of strength, namely the (lower) limit of plastic flow (l.p.f.), defined as the stress beyond which plastic flow, a special form of deformation, appears. Plastic flow can be observed in compression, tension, shear, bending, torsion etc., hence it is an essential characteristic of wood. Whereas at loads below the l.p.f. wood is characterized by constant elastic properties and resistance to the external load, the mechanical state of wood at loads exceeding the l.p.f. is characterized by a rapid increase of elastic deformations and by the development of irreversible plastic-flow changes that result in the inevitable failure of the wood. The l.p.f., can be determined by the usual sustained-load tests only to an accuracy of ± 10%; moreover, this method requires a very long time and the use of 10–15 specimens of identical properties. A quick determination of the l.p.f. is, however, possible, based on the relationships established by the author for the total deformations of wood. If the load-increase rate is constant, the relationship between total deformations and the stress is expressed by an empirical quadratic equation

$$\frac{\epsilon}{\sigma} = a_1\sigma + a_2\sigma^2$$

where $a_1\sigma$ is the elastic deformation, $a_2\sigma^2$ the residual deformation, σ the stress, and a_1 and a_2 are constants. The curve of the abscissae differences (first differential quotient) of a second-degree curve is a straight line. Hence the graph of the differences of total deformations is a straight line up to the l.p.f. This method enables the l.p.f. to be determined for a

single sample in 2–3 min. testing time with an accuracy of 3–5%, the results being in agreement with those obtained by the usual sustained-load method. By 1949, several thousand determinations of the l.p.f. of different species (in compression parallel and across the grain, tension parallel to the grain, bending, and shear parallel to the grain) had been carried out in various laboratories of the U.S.S.R. Of the usual indices of the mechanical strength of wood—the maximum load or strength limit, and the limit of proportionality—the former is shown to depend on the test conditions and the latter to vary with the graph scale chosen. Both disadvantages are eliminated in the new method. The experimental set-up is described in some detail. The deformation indicator is arranged above and in line with the axis of the specimen. For compression across the grain, the load increase rate is 60 kg./min.; for compression parallel to the grain, 600 kg./min. Similar figures and arrangements are also given for the determination of the l.p.f. in other tests.

3723. Panferov, K. V. Uprugostj i pročnostj ranneĭ i pozdneĭ drevesiny sosny pri sžatii poperek volokon. **[Elasticity and strength of the early and late wood of Pine when compressed at right angles to the grain.]** *Trud. Inst. Les.* No. 4, 1949 (219–30). 2 refs. [Russ.russ.]

Describes the results of determinations of the limit of plastic flow (l.p.f.) and the modulus of elasticity of the early (e.w.) and late wood (l.w.) when subjected to compression at right angles to the grain. The specimens were taken from wide-ringed sapwood (near the heartwood) of a Pine log of 65–70 cm. diam. The [nominal?] density of e.w. was 0·381, of l.w. 0·770, of the wood as a whole 0·500. The average value of the l.p.f. (radial compression) was: e.w. 52·3, l.w. 157·6, whole wood 43·7 kg./sq. cm.; for radial compression, the strength of the whole wood depends on that of the e.w. of the weakest annual ring. The average values of the modulus of elasticity for radial compression were: e.w. 7220, l.w. 18,600, whole wood 9550 kg./sq. cm. A special technique was developed to eliminate deformations inherent in the apparatus and also contact deformations.

3724. Higgins, H. G. **Factors influencing the plastic deformation of timber and plywood in compression.** *Aust. J. appl. Sci.* 4 (1), 1953 (84–97). 14 refs. P.R.

Presents the results of an investigation of the relative effects of different factors on the plastic deformation of wood under compression at right angles to the grain. It has been found that solid specimens are subject to 'glide' along rings, which gives anomalous results. Discusses the advantages of adopting as yield value the pressure, or stress, at which appreciable residual deformation takes place, determined from a series of independent tests at different loads kept constant during a test. The duration of loading appears in such tests to be an important factor in residual deformation only at higher pressures. An investigation on the effect of time on total deformation shows that the deformation/time curves might be amenable to rheological analysis. Glues used in the plywood specimens have considerable effect on plastic deformation. As the moisture content increases (below the fibre-saturation point), the residual deformation increases, and the yield value declines. Residual deformation varies with species, due mainly to differences in density rather than in structure. *From author's summary.*

3725. Kisser, J., and Steininger, A. Makroskopische und mikroskopische Strukturänderungen bei der Biegebeanspruchung von Holz. **[Macroscopic and microscopic structural changes in wood subjected to bending stress.]** *Holz Roh- u. Werkstoff* 10 (11), 1952 (415–21). 28 refs. [G.g.] P.R.

Besides the two load values usually determined in bending strength investigations, viz. maximum (rupture) load (I) and load causing gross (macroscopic) compression failures (II) at the compression face of the test specimen, the authors introduce a third load, namely that causing compression failures visible only under a microscope (III). It has been found that the ratios I/II/III are almost identical for Spruce, Silver Fir, and European Larch, when determined for the same moisture content; these ratios, moreover, are independent of m.c. for m.c. below 20–30%, and can be expressed by 1·9/1·52/1. The I/II ratios found by the authors agree well with figures quoted by Staudacher [cf. *For. Abstr.* 5 (35)], while the authors' ratios III/I are very close to Staudacher's creep-load/maximum-load ratio. [Cf. *For. Abstr.* 13 (No. 636).]

3726. Graf, O. Untersuchungen über den Knickwiderstand von einteiligen Stützen aus Holz. **[Investigations on the buckling resistance of single-member wooden supports.]** *Bauingenieur, Berlin* 26 (2; 3; 6), 1951 (47–50; 78–83; 169–71). 11 refs. [G.g.] L.S.

Only small scantlings from wood of uniform and straight growth withstand the calculated buckling load when the load is applied exactly centrally. In larger or less uniformly grown scantlings, an inner excentricity is observed, which for scantlings of 15 cm. side sometimes reaches 1·2 cm. The effect of knots and irregular grain on the elasticity and buckling strength of timbers is considerable: the ratio actual/calculated buckling strength was 0·92 for quality-I, and 0·82 for quality-III timber.

3727. Kloot, N. H. **Impact hardness tests on wood. I. The effects of machine variables.** *Aust. J. appl. Sci.* 4 (1), 1953 (65–76). 8 refs. P.R.

Impact hardness tests by the falling-ball technique have been made on several timber species (broad-leaved and conifers), a permanent record of the area of the contact surface being provided by using carbon paper. The contact area is directly proportional to the square of the ball diameter and the square root of both the ball density and height of drop, which confirms that the volume of non-elastic indentation is directly proportional to the energy of impact. *From author's summary.*

3728. Mayer-Wegelin, H. **The hardness tester. A new instrument for the investigation of annual ring structure and wood grain.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 1494, 1951. pp. 20 + 1 photo + 1 dgm. + 15 gphs. 8 refs. Transl. by

H. E. Kijlstra from *Allg. Forst- u. Jagdztg.* 122 (1), 1950 (12–23). [Cf. *For. Abstr.* 14 (No. 1510).]

3729. KEYLWERTH, R. Querschnittübergänge an Zuggliedern und Zugprüfstäben aus Holz. [**Cross-section transitions in wooden tensile members and tensile-strength test specimens.**] *Bauingenieur, Berlin* 26 (2), 1951 (42–4). [G.g.] L.S.

An equation is derived for computing the optimum contour at the shoulder of tensile-strength test specimens and tensile structural members.

3730. MARKWARDT, L. J. **How surface condition of nails affects their holding power in wood.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1927, 1952. pp. 4 + 1 dgm. + 2 tbls. P.R.

Tests and observations in practice enable the following conclusions to be drawn: (1) a properly applied cement coating may increase the holding power of nails considerably in softer woods, this increase dropping in time; (2) barbing or similar drastic roughening of the nail-shank reduces the immediate resistance to withdrawal; (3) a minutely pitted or etched surface in accordance with the F.P.L. treatment gives a holding power mugh higher than that of cement-coated nails; (4) dusting with graphite or talc to facilitate the movement of cement-coated nails in a nailing machine prejudices their holding power.

3731. NAKAMURA, T. **Spike killing of railway ties.** *J. Jap. For. Soc.* 34 (7), 1952 (211–6). [Jap.e.]

Presents some data, in tables and graphs, for the holding power of spikes and screws in *Fagus crenata* and *Pinus* sp., untreated and creosoted, and of various ages.

3732. ORMAN, H. R. **The holding power of staples in creosoted posts.** *For. Prod. Res. Notes N.Z. For. Serv.* 1 (4), 1952 (11–7).

Tests were made on untreated Totara (*Podocarpus totara*) and on creosoted and untreated Larch (*Larix decidua*), Douglas Fir (*Pseudotsuga taxifolia*) and Corsican Pine (*Pinus nigra* var. *calabrica*). The following results were obtained: (1) Larch and Douglas Fir held staples better than Corsican Pine and when not creosoted gave similar results to Totara. (2) Creosoting reduced holding power of shear staples by 25%. (3) An increase in staple size gave a marked increase in holding power in untreated and a less marked increase in creosoted wood. An increase of ½ in. in shear staple size in creosoted woods counterbalanced the loss in staple-holding power caused by creosoting. (4) Barb staples gave lower values for holding efficiency than shear staples in both creosoted and untreated posts.

812.8. Workability. Working Properties

3733. [**Working properties of *Albizzia falcata* wood.**] *Rep. For. Dep. Fiji 1951*, 1953 (5).

Tests carried out in Australia on one log of *A. falcata* from Fiji, indicated that it can be kiln dried safely and quickly with low shrinkage, but that it is too light (16 lb./cu. ft.) for case making, except perhaps for small cases for local use. Results from peeling veneers off the single log were promising. It presented no difficulties in sawing, and planed to a smooth surface.

3734. TATTO, L. **Boring of six Brazilian hardwoods.** *Arq. Serv. flor., Brasil* 5, 1951 (3–13). [E.e.port.]

Specimens were tested for power consumed in boring ½-in. and ¾-in. holes tangentially, radially and longitudinally, and the surface of the holes was classed as smooth, rough, or woolly. All the woods exhibited good boring qualities, but Imbuia (*Phoebe porosa*), Macacauba (*Platymiscium ulei*), Macaranduba (*Mimusops huberi*) and Mahogany (*Swietenia macrophylla*) were better than Pau amarelo (*Euxylophora paraensis*) and Sucupira (*Bowdichia brasiliensis*), requiring less power. With the exception of Mahogany and Imbuia the surfaces were smooth. In general, there is a direct relationship between power consumed and specific gravity.

813. *Wood Chemistry*

3735. **List of publications on chemistry of wood and derived products.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*238, 1952. pp. 41. P.R.

3736. POGGI, A. R., and MILLETTI, M. La reazione del fuscello. Nota preliminare. [**The reaction of wood shavings. Preliminary note.**] *Annali di Chimica, Roma* 41 (11/12), 1951 (761–75). 13 refs. [It.it.] L.P.S.

A study was made of the colour reaction of wood shavings soaked in HCl and then exposed to the vapour of pyrrole (C_4H_5N), or indene (C_9H_8). It was found that the intense red colour obtained in this way was common to all the wood tested and was not peculiar to Fir and Pine as had been supposed. The duration of immersion in HCl and of subsequent exposure to the air, and the degree of drying of the shavings, appeared to have no effect on the colour reaction. It was ascertained that both cellulose and lignin give the colour reaction, which cannot, therefore, be attributed to the presence of carbonyl compounds in the wood. It was also demonstrated that the green colour reaction hitherto attributed to furane compounds was due to the unaided action of HCl.

3737. RITTER, G. J. **The chemistry and chemical utilization of Beech [*Fagus grandifolia*].** *Beech Utiliz. Ser. Ntheast. For. Exp. Sta.* No. 4, 1952. pp. 17. 21 refs.

A review of literature on the composition of Beech wood, bark, and nuts, the chemical utilization of Beech wood, destructive distillation products, and chemically modified woods (Lignostone, Lignofol, Impreg, Compreg, Staypak and wax-treated wood).

3738. STEWART, C. M., AMOS, G. L., and HARVEY, L. J. **Chemical studies on *Eucalyptus regnans* F. Muell.** *Aust. J. biol. Sci.* 6 (1), 1953 (21–48 + 8 photos). 42 refs. P.R.

Presents results of quantitative analysis for extraneous materials, lignin, and carbohydrate constituents in samples of the outer phloem, inner phloem, cambial zone, developing sapwood, sapwood, and heartwood, of young *E. regnans* trees. The hexose carbohydrate content varied between 12% (cambial zone) and 58% (xylem). The apparent Klason lignin content varied between 12%

(developing sapwood) and 25% (outer phloem and heartwood). Concentration of sugars in the fluids around the cambial zone is ca. 1%, while in the sapwood and heartwood it is very low. It was found that material oven-dried at ca. 105° C. yields misleading analytical results, particularly for lignin.

813.1. Chief Organic Constituents. Constituents of the Cell Wall

See also Nos. 3694, 3696, 3936.

3739. Pew, J. C. **Color reactions of lignin in solution compared with lignin in the solid state.** *J. Amer. chem. Soc.* 74 (22), 1952 (5784–5). 4 refs. [Forest Products Laboratory, Madison.] O.R.S.

3740. Schubert, W. J., Passannante, A., Stevens, G. de, Bier, M., and Nord, F. F. **Investigations on lignin and lignification. XIII. Electrophoresis of native and enzymatically liberated lignins.** *J. Amer. chem. Soc.* 75 (8), 1953 (1869–73). Many refs. O.R.S.

[Cf. *For. Abstr.* 14 (Nos. 659–60).]

The native lignins of Oak and White Scots Pine were analysed electrophoretically at various stages of purification, and the dependence of their electrophoretic mobility on pH and ionic strength was determined. With purified Oak lignin a symmetrical boundary characteristic of an electrophoretically homogeneous compound was observed, while the Scots Pine lignin presented patterns characteristic of a multicomponent system. Patterns identical with those for native lignin were obtained from enzymatically-liberated lignin of Scots Pine. Maple and cork lignins gave patterns characteristic of a homogeneous compound, and bagasse native lignin showed only slight inhomogeneity.

3741. Aulin-Erdtman, G. **Spectrographic contributions to lignin chemistry III. Investigations on model compounds. IV. A method for the elucidation and estimation of phenolic elements.** *Svensk Papp-Tidn.* 56 (3; 8), 1953 (91–101; 287–91). 35 + 3 refs. [E.e.] P.R.

Cf. *For. Abstr.* 14 (No. 1519).

3742. Kratzl, K., and Tschamler, H. Ultrarotspektren von Holz und unlöslichen Ligninen. **[Infra-red spectra of wood and insoluble lignins.]** *Monatshefte für Chemie, Wien* 83 (3), 1952 (786–91). 9 refs. [G.g.] D.S.I.R.

The infra-red spectra of different insoluble and soluble lignins, of a dry residue of an aqueous wood extract, and of Spruce wood, show absorption bands at 6·3 and 6·6μ, characteristic of the C=C frequencies of an aromatic compound. The infra-red spectrum of Spruce wood is very similar to that of 6-tritylcellulose between 6·2 and 6·8μ, but differs much from that of methylcellulose.

3743. Richtzenhain, H., and Dryselius, E. Zur Frage der Existenz von säurelöslichem Lignin. **[The existence of acid-soluble lignin.]** *Svensk Papp-Tidn.* 56 (9), 1953 (324–7). 12 refs. [G.e.sw.] P.R.

Spectrophotometric measurements of unheated H_2SO_4 lignin hydrolysates of Spruce, Beech and Aspen show that only very small quantities of lignin are present [cf. *For. Abstr.* 14 (No. 1526)]. Heating the solutions for spectrophotometric determination causes the formation of carbohydrate change products; these show very high ultra-violet absorption values similar to those for lignin preparations. Graphs are given showing differences in the ultra-violet spectrum of glucose and xylose treated with 3% H_2SO_4 without heating and heated for 2, 4 and 6 hours, and of Spruce, Beech and Aspen hydrolysates unheated and heated for different periods.

3744. Zenczak, P. **Extraction of lignin from wood with triethylene glycol.** *Northw. Sci.* 26 (4), 1952 (145–51). 4 refs. L.S.

Wood chips, bark, or sawdust is heated 1–4 hours at 120–140° C. with triethyleneglycol containing 0·2–0·4% of a catalyst (metal chloride, dry or aqueous HCl), and triethyleneglycol-lignin is precipitated with water from the filtrate, and then purified by repeated precipitation from dioxane by $(C_2H_5)_2O$. This lignin is soluble in many polar organic solvents, $CHCl_3$, solutions of NaOH and Na_2CO_3 etc. Its methoxyl content is 15·3%. When heated it undergoes self-polymerization.

3745. Merewether, J. W. T. **Studies on the lignin of *Eucalyptus regnans* F. Muell. V. Ethanol lignin.** *Aust. J. Chem.* 6 (1), 1953 (44–52). 16 refs. P.R.

Lignin isolated from *E. regnans* wood meal by refluxing with ethanolic HCl was separated into ethanol-lignin A (insoluble in ether) and ethanol-lignin B (soluble in ether). Ethanol-lignin A was found to have an equivalent weight of 1400; if this is its molecular weight, it should contain 2 ethoxyl and 9 methoxyl groups. The products of reactions with acetic anhydride, benzoyl chloride, diazomethane, and some other reactions are consistent with the formula $C_{59}H_{38}O_{10}(OC_5H_5)_2(OCH_3)_9(OH)_7$. [Cf. *For. Abstr.* 12 (No. 2041).] *From author's summary.*

3746. Kleinert, T. Über Ligninhydrierung mittels Cyclohexanols. **[Hydrogenation of lignin by means of cyclohexanol.]** *Monatshefte für Chemie, Wien* 83 (3), 1952 (623–8). 14 refs. [G.g.] D.S.I.R.

The transfer of H from cyclo-hexanol to lignin is the result of the dehydrogenation of the former by the latter. The hydrogenation is not a momentary reaction, and depends on pH. The hydrogenation products are discussed.

3747. Kratzl, K., and Silbernagel, H. Über das Verhalten von Fichtenholz und Lignin bei thermischer Behandlung mit Wasser. **[Behaviour of Spruce wood and lignin during thermal treatment with water.]** *Monatshefte für Chemie, Wien* 83 (4), 1952 (1022–37). 25 refs. [G.g.] L.S.

Repeated heating with water (for 2-hour periods) of Spruce wood extracted with C_6H_6 and C_2H_5OH yields an extract containing polysaccharides and lignin. When the heating period is increased (to 4·5 hours) the amount of dissolved hemicellulose increases, while that of soluble lignin remains the same at 3% of total weight. Absorption spectra of the acid lignin obtained from the extract reveal the existence of double C bonds. When Spruce wood is heated with water to over 100° C., chemical changes take place in the lignin (e.g. oxidizability to form vanillin decreases). When heated in the absence of water, large quantities of vanillin are

obtained. It is suggested that carbohydrates exert a protective action which is lessened when they are removed by hydrolysis.

3748. GROHN, H. Untersuchungen über den Kohlenhydrat-Lignin-Komplex des Fichtenholzes. I. Übersicht über den Stand der Forschung. II. Experimenteller Teil. **[Investigations on the cellulose/lignin complex of Sprucewood. I. Review of present position of research. II. Experimental part.]** *Chemische Technik, Berlin* 3 (8; 10), 1951 (240–4; 299–302). 37 refs. [G.g.] L.S.

The general survey (Part I) includes, as a special section, an account of work done in the U.S.S.R. The author's own experiments were conducted on Swedish Spruce sawdust, comparative tests being carried out on sulphite cellulose and Pine sawdust. The main results were: (1) intense dry grinding of Spruce sawdust alters its solubility in lower alcohols, dilute acids and bases, and NH_4 oxalate solution; (2) up to 60% of the lignin content of the mechanically treated Spruce sawdust dissolves in *N*/20 NaOH at room temperature, with a simultaneous lowering of the OCH_3 content; (3) the uronic-acid content of Spruce sawdust and sulphite cellulose increases during the dry mechanical treatment; and (4) extraction with *N*/20 NaOH at room temperature dissolves from normal Spruce sawdust a small portion, but from the mechanically treated sawdust more than half of the uronic acids.

3749. ISHIKAWA, H., and KONO, T. **[Studies on lignin (V). Reaction of $HClO_4$ with cellulose and wood.]** *J. Jap. For. Soc.* 34 (2), 1952 (52–6). 6 refs. [Jap.e.]

The mechanism of the reaction of $HClO_4$ with wood cellulose was similar to that with native (cotton and pulp) cellulose. The concentration of $HClO_4$ marking the limit between inter- and intramicellar reaction was about 50%. The lignin residue isolated from ground wood treated with 75% $HClO_4$, by washing with the same concentration of $HClO_4$ was 96·15% of 66% H_2SO_4 lignin. *From authors' summary.*

3750. GUSTAFSSON, C., OLLINMAA, P. J., and SAARNIO, J. **The carbohydrates in Birch wood.** *Acta chem. scand.* 6 (8), 1952 (1299–1300). 8 refs. [E.] [Oy Keskuslaboratorio, Helsinki.] O.R.S.

In normal wood the carbohydrate composition determined from the hydrolysates of different samples of *B. pubescens* and *B. verrucosa* from widely different locations was fairly constant, with characteristically high contents of xylan. Tension wood contained more galactan and glucosan and less xylan than normal wood. In a further series of experiments, these sugars, small amounts of rhamnose and some compounds not yet identified were detected in Birch hydrolysates.

3751. ASUNMAA, S., and LANGE, P. W. **Distribution of the carboxyl groups in the cell wall of Spruce and Birch holocellulose and cotton.** *Svensk PappTidn.* 55 (6), 1952 (217–23). 20 refs. [E.sw.g.] P.R

Part II of 'The distribution of the components in the plant cell wall'. [Cf. *For. Abstr.* 12 (No. 3017) for Part I.]

Microspectographic determination showed that the concentration of carboxyl groups is highest in the outer layer of the cell wall in Spruce and Birch, decreasing almost linearly towards the lumen. In cotton the carboxyl groups are present almost exclusively in the outer layer. The relation between their distribution in the woody cell wall and that of the hemicelluloses is briefly discussed.

3752. ASUNMAA, S., and LANGE, P. W. **Esterification of the carbohydrates in the plant cell wall with *p*-phenylazobenzoyl chloride for microspectrographic investigation.** *Svensk PappTidn.* 56 (3), 1953 (85–90). 9 refs. [E.e.sw.g.] P.R.

Part III of 'The distribution of the components in the plant cell-wall'. Describes the method which by combining the carbohydrates with a light-absorbing component allows microspectrographic study, and illustrates results with photomicrographs.

3753. GRAN, G. **Determination of alkoxyl groups III. An investigation on the determination of methoxyl in carbohydrate-containing substances [wood pulp, wood cellulose preparations and wood flour.]** *Svensk PappTidn.* 56 (5), 1953 (179–80). 9 refs. P.R.

3754. SAEMAN, J. F., MILLETT, M. A., and LAWTON, E. J. **Effect of high-energy cathode rays on cellulose.** *Industr. Engng. Chem.* 44 (12), 1952 (2848–52). 16 refs. P.R.

Presents results of the irradiation of cellulose in cotton linters and wood with high-voltage cathode rays. The decomposition of carbohydrate (based on initial carbohydrate content), caused by the irradiation of 10^8 equivalent röntgens, was 14% for cotton linters and glucose, 17% for wood pulp, and 9% for wood. The depolymerization of cellulose (in cotton linters and high-α softwood sulphite pulp) was perceptible at ca. 10^6 eq. röntgens, while at a dosage of 5×10^8, cellulose was converted to water-soluble materials, the behaviour of cellulose in both materials being almost identical. The rate of hydrolysis of the resistant cellulose is greatly increased by irradiation, probably because of the disruption of cellulose crystallites.

3755. STEWART, C. M., and FOSTER, D. H. **Identification of 4-methyl-D-glucuronic acid in *Eucalyptus regnans* wood.** *Nature, Lond.* 171 (4357), 1953 (792). 10 refs. [Division of Forest Products, C.S.I.R.O., Melbourne.]

813.2. Minor Organic Constituents. Extractives. Cell Contents

See also No. 3710.

3756. HILLIS, W. E. **A chromatographic examination of the minor constituents of various tree zones.** *J. Sci. Food Agric.* 4 (3), 1953 (135–48). 25 refs. O.R.S.

The methanol extract of the bark, phloem, sapwood and heartwood zones of 22 species of hardwoods representing 11 families were examined chromatographically with 3 different solvents. The species examined included 6 without heartwood, 1 with wide sapwood, 6 with heartwood of pathological origin and 9 with apparently normal heartwood formation. Chromatograms of 9 of the trees

are given. Information obtained from the chromatograms assisted in the identification of rutin and ellagic acid, but identification of the components indicated is not always easy. The phenol solvent usually gave better results than the butanol and cresol ones, especially on the *Eucalyptus* spp. examined, by virtue of sharpness of resolution, completeness of differentiation and stability of colour. Phenolic and C_{15} compounds have been detected among the resolved components in heartwood extracts. Both normal and pathological heartwoods showed stronger fluorescence than the sapwood, the increase being due most often to a greater amount of extractives of the same general composition as found in the rest of the tree, and not to the formation of new compounds. *Euroschinus falcatus*, *Pithecellobium pruinosum* and *Acacia dealbata*, all with very similar chromatograms, did not show a simple increase in extractives when heartwood was formed; for most species, the major components of the heartwood were also found in the sapwood, but this was not true for these 3 species. Trees without heartwood were characterized by the small amount of extractives present; however, when their extractives were compared with those of sapwood for normal heartwood trees there was no great difference in the amount of resolved components, nor in their nature. The sample of *Sloanea woollsii* examined had a typically wide sapwood; the composition of the extractives did not change across the sapwood but the amount of extractives present was larger than with sapwood of other trees, and the amount was slightly greater in the inner sapwood. Similarity of chromatograms was found within the families Leguminosae, Myrtaceae and Rubiaceae, but chromatography of the extracts cannot be used for direct identification of family. For the *Eucalyptus* spp. examined no distinctive feature was found that could be correlated with divisions based on bark type (box, stringybark etc.). Differences in extractives between bark and wood zones were found in only 2 species, *Croton phebalioides* and *Rapanea variabilis* An examination of the kinds and of extracts of the leaves and roots of some Eucalypts, failed to show any special part played by them in the formation of extractives.

3757. Mentzer, C., and Pachéco, H. Sur quelques nouveaux constituants des extraits de bois. [**Some new constituents of wood extracts.**] *Bulletin de la Société de Chimie Biologique, Paris* 34 (5/6; 10), 1952 (576–85; 956–62). 17 refs. [F.] L.S.

Describes a chromatographic method of identifying various species of wood, and of discovering new compounds in woods. Chrysin (5,7-dihydroxyflavone) and 5,7-dihydroxyflavanone are shown to be present in Cherry heartwood, but absent in Apple and Pear woods.

3758. Gripenberg, J. **Flavanones from the heartwood of *Larix decidua* Mill. (*L. europaea* DC.).** *Acta chem. scand.* 6 (8), 1952 (1152–6). 13 refs. [E.e.] [Institute of Technology, Helsinki.] O.R.S.

Dihydrokaempferol and dihydroquercetin have been isolated from heartwood of *L. decidua*. The former has been shown to be identical with aromadendrin previously isolated from *Nothofagus dombeyi* and *Eucalyptus* spp., and the latter with taxifolin previously isolated from *Pseudotsuga taxifolia*. *From author's summary.*

3759. Lindstedt, G., and Missiorny, A. **Constituents of Pine heartwood XXIX. A synthesis of strobochrysin dimethyl ether (5,7-dimethoxy-6-methyl flavone).** *Acta chem. scand.* 6 (8), 1952 (1212–6). 8 refs. [E.e.] [Kungl. Tekniska Högskolan, Stockholm.] O.R.S.

Cf. *For. Abstr.* 14 (No. 1534).

3760. Hasegawa, M. **On phenolic substances of wood. II. On four colouring matters obtained from the wood of *Cercidiphyllum japonicum*.** *Miscellaneous Reports of the Research Institute of Natural Resources, Tokyo* No. 17/18, 1950 (57–60). 4 refs. [Jap.e.] L.B.M.N.

The author has obtained two flavanolols and two flavanols from the methanol extract of this wood. Two of these products are water-soluble (ampeloptin, m.p. 246° C., and katsuranin, m.p., 227°), the other two being water-insoluble (kaempferol and myricetin). *From author's summary.*

3761. Pigman, W., Anderson, E., Fischer, R. Buchanan, M. A., and Browning, B. L. **Color precursors in Spruce- and Western Hemlock-woods and inner barks.** *Tappi* 36 (1), 1953 (4–12). 23 refs. P.R.

Inner bark of *Picea mariana* and wood of *Tsuga heterophylla* contain materials which develop a red color when treated with mineral acids, preferably in the presence of alcohols. These substances appear to be leucoanthocyanins. Descriptions are given of a systematic investigation on conditions affecting the tests, and of two semi-quantitative methods for the determination of these substances. The leucoanthocyanins are found in the inner bark and cambium but not in the wood of *P. mariana*. Related materials in both water-soluble and water-insoluble forms are found in all fractions of the wood, inner bark, and cambium of *T. heterophylla*. The composition of the leucoanthocyanin from the inner bark of *P. mariana* has been studied; it appears to have the formula $C_{15}H_9(OH)_3(OCH_3)(C_6H_{11}O_6)$.

3762. Cocker, E., and Cocker, W. **An anthocyanidin of Louro Inamui [*Nectandra elaiophora*].** *J. chem. Soc.* Dec., 1952 (5035–6). O.R.S.

An extract from shavings of the wood contains a new anthocyanidin resembling peonidin in many of its properties.

3763. King, F. E., and King, T. J. **Improved extraction of baikiain.** *Chem. & Ind.* 1953 (20), (489). 5 refs. P.R.

Cf. *For. Abstr.* 13 (No. 648).

3764. King, F. E., Grundon, M. F., and Neill, K. G. **The chemistry of extractives from hardwoods. Part IX. Constituents of the heartwood of *Ferreira spectabilis*.** *J. chem. Soc.* Dec., 1952 (4580–4). [The University, Nottingham.] O.R.S.

Cf. *For. Abstr.* 14 (No. 1532).

3765. King, F. E., and Neill, K. G. **The chemistry of extractives from hardwoods. Part X. The**

constitutions of ferreirin and of homoferreirin [from the heartwood of *Ferreira spectabilis*]. *J. chem. Soc.* Dec., 1952 (4752–6). O.R.S.

3766. KING, F. E., KING, T. J., and NEILL, K. G. **The chemistry of extractives from hardwoods. Part XI. The isolation of a diterpene ester (methyl vinhaticoate), and of 6:7:3′:4′-tetrahydroxyflavanone (plathymenin) and 2:4:5:3′:4′-pentahydroxychalkone (*neo*plathymenin) from *Plathymenia reticulata*.** *J. chem. Soc.* April, 1953 (1055–9). O.R.S.

3767. KING, F. E., and JURD, L. **The chemistry of extractives from hardwoods. Part XII. The cyclitols and steroids of Opepe (*Sarcocephalus diderrichii*).** *J. chem. Soc.* April, 1953 (1192–5). O.R.S.

*meso*Inositol and an optically active *o*-methyl-*meso*inositol (yield 3·5%) are present in aqueous and alcoholic extractives of the wood of *S. diderrichii*. Among the constituents isolable with light petroleum are 'β'-sitosterol and the previously unknown 'β'-sitosteryl palmitate.

3768. BALLOU, C. E., and ANDERSON, A. B. **On the cyclitols present in Sugar Pine (*Pinus lambertiana* Dougl.).** *J. Amer. chem. Soc.* 75 (3), 1953 (648–50). 16 refs. O.R.S.

813.3. Ash Constituents

See No. 3925.

813.5. Reaction with Metals

3769. [GARDNER, J. A. F.] **New uses of Cedar.** *B.C. Lumberm.* 37 (3), 1953 (75, 84–5).

Summarizes a paper presented at a sectional meeting of the Chemical Institute of Canada, reporting on research by the Vancouver Forest Products Laboratory on the chemistry of *Thuja plicata* with special reference to corrosion during pulping.

813.6. Effect of Chemicals on Wood. Resistance to Chemical Attack

See No. 3827.

813.7. Odour and Taste

3770. SWEETMAN, H. L., BENSON, D. A., and KELLEY, R. W., JR. **Efficacy of aroma of Cedar in control of fabric pests.** *J. econ. Ent.* 46 (1), 1953 (29–33). 7 refs.

The aroma of Cedar oil (from the heartwood of *Juniperus virginiana*) in a commercial cedar plaster had no repellent or toxic effects on *Tineola bisselliella*, *Attagenus piceus* or *Anthrenus vorax*. No definite conclusion could be reached concerning the possible protective value of the aroma of Cedar in well fitting chests.

814. *Natural Durability. Old Wood. Fossilized Wood*

See Nos. 3082–3.

815. *Effect of Growth Factors on Structure and Properties*

See also Nos. 3338, 3682, 3693, 3699.

3771. ORMAN, H. R. **Physical properties of *Pinus patula* from Whakarewarewa and Kaingaroa State Forests.** *For. Prod. Res. Notes N.Z. For. Serv.* 1 (3), 1952. pp. 24. 8 refs.

Eight trees were sampled, 1 of 45 years, 4 of 37, and 3 of 16 years. Basic sp. gr. (oven-dry wt./maximum vol.) was 0·34 for 16-year and 0·37 for 37- and 45-year trees. The air-dry density of 37- and 45-year trees was 29 lb./cu. ft. Tabulated figures show variation in sp. gr. for 37- and 16-year trees and the amount of shrinkage from green to air-dry and oven-dry for 37-year trees, for samples at different heights in the tree and in different radial positions. Sp. gr. and volumetric and radial shrinkage decrease from bark to pith; tangential and longitudinal remain more constant. There are indications that sp. gr. and volumetric and radial shrinkage decrease with increasing height, tangential and longitudinal shrinkage again being more constant. Mean values for shrinkage in 37-year trees are volumetric 10·8, tangential 6·9, radial 3·7 and longitudinal 0·3%. Comparison with figures from S. Africa shows a similar radial-density gradient. The New Zealand material came from stands that had received little silvicultural treatment; the early rate of growth was high but was soon considerably reduced by severe suppression, and more frequent thinning is recommended.

82. CONVERSION, SHAPING, ASSEMBLY AND FINISHING OF WOOD: GENERAL

3772. Technische Messe Hannover. Vorbericht Holzbearbeitungsmaschinen. **[Hanover Technological Fair. Preliminary report on woodworking machines.]** *Holztechnik* 33 (4), 1953 (176–96, 205–12). [G.] P.R.

An illustrated description of different woodworking machines exhibited by 110 manufacturing firms in section 8 of the Hanover Engineering Fair, 1953.

3773. Vorschau auf die Technische Messe Hannover 1953. **[Preview of the Hanover Technological Fair 1953.]** *Holz Roh- u. Werkstoff* 11 (4), 1953 (121–65). 25 refs. [G.g.] P.R.

Contains the following papers giving illustrated descriptions of the various machines and appliances exhibited: woodworking machines for shaping by cutting (*F. Schulz*); machines for shaping without cutting (*F. Fessel*); combined woodworking machines (*J. Piller*); machines and installations for manufacturing railway sleepers (*H. Ridder*); machines for the manufacture of wooden barrels (*F. Fessel*); machines for the manufacture of brushes and brooms (*K. Vollgärtner*); new developments in machines for the maintenance of tools for woodworking machines (*H. Pause* and *M. Schmausser*); straining of frame-saw blades, in particular by means of hydraulic straining appliances (*F. Kollman*); machines in timber transport (*K. Lünzmann*).

3774. KIVIMAA, E. Was ist die Abstumpfung der Holzbearbeitungswerkzeuge? **[Blunting of woodworking tools.]** *Holz Roh- u. Werkstoff* 10 (11), 1952 (425–8). 1 ref. [G.g.] P.R.

Tests on the blunting of tools show that the main cutting force [cf. *For. Abstr.* 13 (No. 1546)] can be advantageously used as a measure of bluntness. It is possible to find for each woodworking process an

optimum cutting speed for which the blunting of the cutter will be least. When 1500 volts D.C. (a few milliamp.) was laid across the cutting gap, with the cutter connected to the negative pole and green Pine wood to the positive, the amount of blunting was reduced (for cutting speeds of 5 and 50 m./sec.) to less than ½–⅓ of that without electrical potential; when the poles were reversed, the blunting increased rapidly. Results with a hard-metal (G2) cutter were even more spectacular: whereas without potential the cutter became very blunt at the beginning of sawing (speed 5 m./sec.), the right application of potential reduced blunting practically to zero. When inspected under a microscope, the edges of cutters that worked 'under potential' were smooth, whereas without potential they were dull and uneven. Since cutting of an oven-dry wood sample was observed to give rise to a potential difference of ca. 1000 volts across the cutting gap, it is believed that this potential difference, when dissipated in green wood, causes electrochemical corrosion of the tool-metal microcrystals, resulting in the loosening of metal fragments, and so promoting blunting. This would account for the fact that the blunting of hard-metal tools working on soft kinds of wood is sometimes greater than that of softer tools on harder woods, and would explain the beneficial effect of properly applied external potential difference.

821. *Barking*

3775. Burton, R. E. **Hydraulic log-barker having kerf-cutting and bark-removing jets.** *U.S. Patent* No. 2,611,401, Sept. 23, 1952. pp. 8 + 5 dgms. P.O.

The log is rotated on its axis. The hydraulic cutting jet is directed radially, and the barking jet is directed into the kerf so formed.

3776. Rambo, W. H., and DeRice, H. A. **Economics of debarking.** *Sth. Lumberm.* 186 (2332), 1953 (43–4).

Concludes on the basis of estimated costs of hydraulic whole-log and slab barking, and values, recovery % and costs of chips, that an 8-hour cut of 125,000 bd. ft. is the minimum for which either log or slab barking is justified.

822. *Saws and Sawing*

See also No. 2971.

3777. Andrews, G. W., and Bell, G. E. **Fundamental sawmill research: report No. 1. (Specific gravity of wood, depth of cut, and bite of tooth—in relation to power requirements.)** *Mimeo. For. Prod. Lab., Can.* No. *O*–168, 1953. pp. 10 + 8 photos + 2 dgms. + 5 gphs. 10 refs.

Direct relationships were found between sp. gr. (of 4 species, range 0·38 to 0·66), depth of cut, and size of bite (the distance each tooth advances in the cut/revolution) respectively and the h.p. required. The effect both of bite and sp. gr. appeared to be greater at higher saw speeds.

3778. Cividini, R., and Prister, M. Prispevek k racionalizaciji dela s krožnimi žagami. [**Rationalization of circular sawing.**] *Strok. znanst. Izd. gozd. Inst. Sloven.* No. 1, 1949. pp. 39 + 4. 9 refs. [Sloven.croat.f.g.]

A guide to the theory and practice of circular saws, based mainly on Soviet, German, and American sources. Figures based on Slovenian experience and recommended for a Slovenian standard are: (1) rip-saws (the first figure refers to softwood, the second to hardwood): sharpness angle 40, 45°; clearance angle 18, 15°; hook angle 32, 30°; tooth top length 0·35–0·5 *t* for either wood; gullet radius 0·12 *t*, 0·1 *t*, and gullet depth 0·5 *t*, 0·4 *t* (where *t* is the tooth pitch); (2) cross-cut saws: sharpness angle 65, 65°; clearance angle 20, 20°; hook angle 5, 5°; tooth top length 0·4–0·5 *t*, 0·5–0·6 *t*; gullet radius 0·12 *t* and gullet depth 0·5–0·67 *t* for either wood. Another table contains the suggested numbers of teeth and pitches for different saws, viz. for rip-sawing 30 teeth for green wood, 60 for dry wood; for cross-cutting 100 teeth for softwoods, and 120 for hardwoods.

3779. Lapin, P. I. Skorostnoe pilenie na kruglopiljnyh stankah. [**High-speed sawing with circular saws.**] *Lesn. Prom.* 11 (1), 1951 (29–32). [Russ.]

Presents preliminary results of introducing high-speed sawing with circular saws in two Soviet mills, plus some theoretical considerations. Tabulates the maximum internal stresses occurring in circular saw blades of 500–800 mm. diameter working at usual speeds (peripheral speed ranging from ca. 50 to ca. 66 m./sec.). Investigations on blade vibration have shown that the frequency of the natural vibrations of a rotating circular sawblade bears the following relationship to the centrifugal force effect: $f^2_{dyn} = f^2_{st} + Bn^2$, where f_{dyn} is the frequency of natural vibrations of a rotating disk, f_{st} the frequency for a stationary disk, n = rev./sec. of the disk, and B is a coefficient depending upon the form of vibrations and varying, according to experimental data, from 1·8 to 5·9. It follows that high-speed work is associated with a higher frequency of natural vibrations, thus eliminating the danger of vibrations corresponding with any form of resonance. It has also been found that, in order to reduce disturbances causing forced vibrations in disks, it is imperative to increase the cutting speed. The recommended magnitudes of hammering are tabulated for blades of 400–700 mm. diameter, and for speeds of 1000 to 3000 rev./ min. Two other tables give the recommended cutting speeds and feeds for (1) two-saw edgers, (2) dockers, (3) re-saws, and (4) 'lath' saw.

3780. Bershadskii, A. L. [Beršadskiĭ, A. L.] **High speed sawing with reduced power consumption.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 1637, 1951. pp. 11 + 3 dgms. + 1 gph. Transl. by M. Slade from *Lesn. Prom.* 11 (5), 1951 (25–8). [See *For. Abstr.* 14 (No. 2672).] Limited distribution.

3781. Orlov, M. N. **Operating conditions in the use of frame saws.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 1530, 1952. pp. 21 + 2 dgms. + 6 gphs. Transl. by P. A. Gibson from *Lesn. Prom.* 1950 (10; 11), (25–9; 22–7). [See *For. Abstr.* 13 (No. 4241).] Limited distribution.

3782. THUNELL, B. Ramsågens rörelse- och skärförhållanden. **[Movement and cutting conditions in frame saws.]** *Pap. ja Puu* 35 (4*a*), 1953 (157–71). 27 refs. [Sw.e.] P.R.

The movement of the mobile frame was calculated for three different types of frame guide, and the mass forces arising were studied and, with the mean shear forces, used to determine the pressure against the mobile frame guides. The relative movements of the teeth and log were calculated and the results used to determine the influence of various factors on tooth incision, 'chip' thickness and volume of sawdust. The necessary clearance angle of the teeth was also calculated. *From author's summary.*

3783. KOLLMANN, F. Das Spannen von Gattersägenblättern, insbesondere mit hydraulischen Spannvorrichtungen. **[Tensioning of frame-saw blades, in particular by means of hydraulic tensioning appliances.]** *Holz Roh- u. Werkstoff* 11 (4), 1953 (156–61). 6 refs. [G.] P.R.

Theoretical considerations of the tensioning of blades in a frame-saw, the decrease of tension due to the heating of blades during operation, and a brief description of mechanical tensioning devices, are followed by a detailed illustrated description of a hydraulic tensioning appliance introduced into the German sawmilling industry about 1942 and manufactured by several German firms. [Cf. *For. Abstr.* 14 (No. 2670).]

3784. LAPIN, P. I. Faktory, vlijajuščie na ustoičivostj ramnyh pil. **[Factors affecting the stability of frame-saws.]** *Lesn. Prom.* 11 (12), 1951 (18–23). 1 ref. [Russ.]

Discusses the tensioning of blades, and their arrangement and mounting in the frame. Tensioning (stretching) by rolls is described in detail, and tables are given of roll pressures for the tensioning of blades of 2·41 to 1·47 mm. thickness. An apparatus for checking the tension of the saw is illustrated and described. The tension in the blade is related to the deflection of the mid-point of the blade under a constant normal horizontal force when the blade is mounted and strained in the frame. Deflections of the toothed and back edges of the blade caused by different strains and tensions are tabulated for (1) saws of different thicknesses, (2) saws of different widths, and (3) combinations of different saw lengths and thicknesses. The effect of the overhang and the strain and tension on the stability of blades is also discussed, as are some methods employed in the longitudinal and transverse mounting of the blade. Final recommendations include standardization of the tensioning zone. Instead of placing the tensioned zone centrally in the width of the saw, it is recommended that the zone should have a width 1/10th that of the saw and its distance from the toothed edge should be $\frac{1}{4}$ of the saw width.

3785. ROŽKOV, D. S. Pljuščenie zubjev ramnyh pil. **[Swage-setting of frame-saw teeth.]** *Lesn. Prom.* 12 (6; 7), 1952 (24–7; 22–5). [Russ.]

The availability since 1950 of improved steels in the Russian saw-manufacturing industry has made it possible to use swage-set teeth in frame-saw blades. The standard angles for these teeth are as follows (the first number applies to summer, the bracketed to winter, conversion): clearance 30° (30°); sharpness 43° (45°); hook 17° (15°); gullet depth is 0·85 (0·75), and gullet radius 0·15 (0·15) of the tooth pitch. The following pitches are recommended for logs of different diameters, the first number giving the log diameter (in cm.), and the bracketed the tooth pitch (in mm.): up to 20 (22); 20–30 (26); 30–40 (30); over 40 (34). The theory and practice of swage-setting are discussed in detail.

3786. EGUND, K. F. Stukning af savtænder. **[Swaging saw teeth.]** *Træindustrien* 2 (7), 1952 (84–8). 10 refs. [Dan.] P.R.

Describes the process of swaging and some equipment used, and discusses recent investigations, mainly Scandinavian, on the relative merits of swage- and spring-setting. [Cf. *For. Abstr.* 14 (No. 679).]

3787. SHERLOCK, F. E. **The technique of grinding. (1) Wheel types and selection. (2) Abrasives and wheel shapes. (3 & 4) Running the wheel. (5) Using the wheel. (6 & 7) The universal grinder.** *Wood* 17 (4–10), 1952 (156–8; 200–2; 243–5; 282–3; 321–4; 358–60; 402–3).

824. *Forms of Joint. Jointing and Assembly*

824.4. Dowelled Joints

3788. TROCHE, A. Lochleibungs-, Kipp- und Reibungsspannungen bei Runddübeln im Ingenieurholzbau. **[Pin, tipping, and frictional stresses in round [wood] dowels used in industrial timber constructions.]** *Holz Roh- u. Werkstoff* 10 (10), 1952 (380–5). 4 refs. [G.g.] P.R.

824.6. Carpenters' and Joiners' Joints

3789. HYLER, J. E. **Dovetail cuts in woodwork joinery.** *Timber of Canada* 12 (10; 11), 1952 (25–7; 24–7, 61).

Describes dovetailing and glue-spreading machinery, and methods of making dovetail cuts.

824.8. Glues and Gluing

See also No. 3789.

3790. MARIAN, J. E., and FICKLER, H. H. Lim för trä: de vanligaste limtypernas egenskaper, beredning och användning. **[Glue for wood: properties, preparation and use of the commonest types of glue.]** *Medd. svenska TräforsknInst. (Trätekn.)* No. 43*B*, 1953. pp. 16 + 2 tbls. 31 refs. [Sw.] P.R.

A review of literature with sections on preparation of the surface and the glue, spreading, pressing and treatment after pressing, the theoretical side of the process of adhesion, special methods of gluing, metal-to-wood gluing, and terminology, with a vocabulary of some 60 gluing terms in Swedish, English, German and French. There are tables summarizing technical data, and purpose and method of use of 25 types of glue.

3791. MARIAN, J. E., and FICKLER, H. H. Die Leime in der Holzindustrie. Eigenschaften, Vorbereitung und Anwendung der gebräuchlichsten

Leimtypen. **[Glues in the timber industry. Properties, preparation, and use of the commonest glue types.]** *Holz Roh- u. Werkstoff* 11 (1), 1953 (18–27). 42 refs. [G.g.] P.R.

Cf. preceding abstract.

3792. MARIAN, J. E., and FICKLER, H. H. Betriebsblatt 2. Eigenschaften von Leimtypen. **[Working sheet 2. Properties of glue types.]** *Holz Roh- u. Werkstoff* 11 (1), 1953 (37–40). [G.] P.R.

Tabulates, for 27 different glue types, general properties, technical properties, and properties of the glue-line, compiled in the Svenska Träforskningsinstitut, Stockholm.

3793. DALTON, L. K. **Resins from sulphited tannins as adhesives for wood.** *Aust. J. appl. Sci.* 4 (1), 1953 (136–45). 4 refs. P.R.

Tannin solutions from *Eucalyptus crebra* and *Pinus radiata*, and commercial Mimosa extracts, were heated with sulphites, and mixed with paraformaldehyde and filler. When examined as plywood glues, they developed strong, water-resistant bonds. *From author's summary.*

3794. COLLINSON, H. A. **Phenol resin glues for plywood.** *Wood* 18 (5; 6), 1953 (172–5; 210–1).

In exposure tests over 5 years at Princes Risborough, failure in plywood bonded with animal and casein glues occurred after 1 and 4 months respectively; in that bonded with urea-formaldehyde resins extended with flour or not extended, after 2 years; and in that bonded with urea-formaldehyde fortified with melamine, after 3½ years. There were signs of failure at the end of 5 years in plywood bonded with melamine formaldehyde, and no signs of failure for that bonded with resorcinol- and phenol- formaldehyde resins. Similar results were obtained for more stringent exposure conditions in Nigeria: urea-formaldehyde resin bonds failed in 18 months, and melamine-formaldehyde and fortified urea-formaldehyde bonds in 2 years, but there was no failure with phenol- and resorcinol-formaldehyde bonds at the end of 2 years. Gluing and pressing conditions to give the best results for phenol-formaldehyde resins are discussed. In an investigation made on the gluing of Canadian Birch it was found that good or excellent adhesion was found when the veneers were glued in tight-to-loose or loose-to-loose assemblies but only poor adhesion for tight-to-tight assemblies. Rough sanding of the tight faces slightly improved adhesion. Tenderizing the tight surfaces by making a diamond pattern with a sharp blade definitely improved adhesion. A number of chemical treatments of the veneer surfaces all failed to improve adhesion. Gluing with resorcinol resins or with phenol resins plus resorcinol gave better tight-to-tight adhesion but increased the price. Canadian Birch is the only timber so far found to exhibit this resistance to gluing.

3795. HIRAI, S., and OGAWARA, J. **[Studies on the Bamboo (VIII). Adhesive strength of *Phyllostachys pubescens* in relation to the cut face.]** *Bull. Tokyo Univ. For.* No. 43, 1952 (159–66). 3 refs. [Jap.jap.e.]

[Cf. *For. Abstr.* 14 (No. 3717).] The adhesive strength of *P. pubescens* glued with urea-resin adhesives was examined in relation to the properties of faces A, B, C and D, cut successively from the outer to the inner part of the culm. The following results were obtained from three samples: (1) The average values show that in all combinations, A and B are superior in adhesive strength to C and D and that there is little difference between C and D. (2) A measurement of the roughness of the surfaces showed a correlation with adhesive strength, A and B being smooth and C and D rough. (3) Their relative hardness, which is considered an index of sp. gr., bore no correlation with the adhesive strength, that for A being very high and those for B, C, and D successively smaller. (4) A statistical examination of the differences of mean values of adhesive strength in combinations of the same faces showed significant differences between A and D, B and C or B and D in all cases, generally no apparent differences between A and C or C and D, and probably no significant difference between A and B. (5) The large % of wood failure in faces C and D suggests that the adhesive strength of those faces is related to the shear strength of the wood. *From authors' summary.*

3796. BOCK, E. Die Prüfung der Festigkeit von Leimverbindungen während des Abbindens des Leimes. **[Testing of the strength of glue-joints during glue-setting.]** *Holz Roh- u. Werkstoff* 10 (10), 1952 (394–8). 2 refs. [G.g.] P.R.

Shows that these tests should be made on specimens with glue-line parallel to fibres, because gluings of this kind form the overwhelming majority of all industrial gluings; moreover, the usual tensile test with a 1 : 4 scarf glue-joint yields values many times greater than those for lap-joints parallel to grain. Discusses different strength tests and recommends the shear-strength test as the most suitable. Suggests new forms of test specimens for both normal and thick glue-lines, and describes the pressing of these specimens during the gluing process.

3797. PLATH, E. Der Abbindevorgang von Kunstharzleimen im Temperaturbereich um 100° C. **[Process of setting of synthetic-resin glues in the temperature range round 100° C.]** *Holz Roh- u. Werkstoff* 10 (11), 1952 (421–5). [G.g.] P.R.

Presents graphed results of tests on different properties of some synthetic-resin glues (polyvinyl acetate, urea-formaldehyde, melamine-formaldehyde) used in the plywood (and fibreboard) industry. One conclusion from these tests is that the hardening reactions of high-condensation glues should be stopped at the moment when the plastic/elastic properties of the glue-line yield the highest strength values. The strength maximum is not identical with 'full hardening'. An undesirable interruption of the hardening reactions may be brought about by removal of water (too dry wood, nature of extender), a sufficiency of which is necessary for obtaining a good glue-line. It is advisable to use extenders that split off water at high temperatures.

3798. MAINE, A. B. **Extenders and fillers in urea resin glues.** *Veneers & Plyw.* 47 (1), 1953 (30–1). P.R.

Gives definitions of filler and extender, and describes the most commonly used fillers (pecan-shell and walnut-shell flours) and extenders (wheat flour).

3799. BERGEY, E. E. (to National Casein Co.). **Method of gluing a plurality of wooden elements comprising curing a urea-formaldehyde adhesive by means of high-frequency heating.** *U.S. Patent* No. 2,591,771, April 8, 1952. pp. 8. P.O.

Wood elements are edge-glued using an aqueous urea-formaldehyde resin containing 60–70% solids and a hardener (NH_4 salts of strong mineral acids and an alkali-earth phosphate); after clamping, R.F. heating is applied through the glue line and in the plane of the adhesive.

825. *Cleaving. Adzing. Mechanical Comminution*

See Nos. 3937, 3948.

827. *Bending. Moulding (other than by Cutting)*

3800. WANGAARD, F. F. **The steam-bending of Beech.** *Beech Utiliz. Ser. Ntheast. For. Exp. Sta.* No. 3, 1952. pp. 26. 17 refs.

Cf. *For. Abstr.* 14 (No. 2697).

829.1. *Finishing*

3801. BROWNE, F. L., and LAUGHNAN, D. F. **Paint performance on forest products. Modification of wood and plywood to improve paintability.** *Rep. U.S. For. Prod. Lab., Madison* No. *D*1926, 1952. pp. 19 + 24 photos + 4 tbls. 20 refs. P.R.

A detailed survey of research conducted for the last 25 years on improving the performance of paint not only on lighter but also on the heavier softwoods which are in more abundant supply. The following processing methods are analysed: stabilizing the wood against swelling and shrinking, covering the wood with thin layers of uniformly textured material, and mechanical treatment of the surface to subdivide the troublesome wide bands of late wood.

83. TIMBER MANUFACTURING INDUSTRIES AND PRODUCTS. USES OF WOOD AS SUCH

3802. HANGER, M. R. **Electric energy use in primary wood manufacture in the Douglas Fir region.** *Timberman* 54 (5), 1953 (54–60).

Tabulates figures based on surveys for 1946–51 showing raw materials used, total energy, KWH/1000 bd. ft. timber, man-hours/1000 bd. ft., and energy obtained by purchase or by mill generation, for a representative sample of the larger sawmills, plywood mills, paper mills and pulp, hardboard and undifferentiated mills of the region.

3803. PEARSON, F. G. O., and RICHARDS, E. G. **Utilization of young plantation timbers.** *Quart. J. For.* 47 (2), 1953 (107–15 + 7 photos).

A paper read at the 6th British Commonwealth Forestry Conference [cf. *For. Abstr.* 14 (No. 1564)] with the addition of illustrations.

831. *Fuelwood and Various Types of Rough Timber*

See also Nos. 3731–2, 3854–9, 3864, 3888, 3909.

3804. **The economic use of firewood in steam locomotives: joint FAO-ECAFE study.** *Docum. FAO Asia-Pacif. For. Comm. 1952* No. 4, 1952. pp. 68. Limited distribution: FAO, Rome.

The economic use of firewood in steam locomotives has been considered from two aspects: (1) How far and in what circumstances can firewood replace coal, lignite and fuel-oil, from a technical point of view; (2) How far and in what circumstances can firewood be made available at a competitive price with other fuels? Members of the responsible bodies visited Burma, Cambodia, Ceylon, Indonesia, Viet-Nam, and East Pakistan, and information was also collected from India, Finland, French overseas territories, Latin America, Malaya, the Philippines, and Thailand. Investigations have been made, and are reported, into the theories of wood burning and improvements in firing techniques, refuelling practices, and locomotive construction. The procurement of firewood, the management of forests and the mechanization of cutting and transport were considered in order to determine whether firewood can be produced at a lower cost; the economy of firewood plantations of quick-growing species was also investigated.

3805. TOKER, R. Türkiyede Okaliptus [*E. rostrata*] ün maden direği bakımından teknik özellikleri hakkında araştırmalar. [**The properties of *Eucalyptus rostrata* with reference to its use as mining timber.**] *Istanbul Üniv. Orm. Fak. Derg.* 2*A* (1), 1952 (126–52 + 13 photos + 5 gphs. + 1 tbl.). 18 refs. [Turk.g.]

Gives results of tests on physical, strength and working properties of timber of *E. rostrata* and of volume/ha. on good sites at 7–8 years, the age found most suitable for its use as mining timber, and suggests suitable uses for it in the mines. *From author's summary.*

3806. BURGER, H. Die Auslese von Gerüststangen und Leitungsmasten im Wald. [**The selection of scaffolding poles and transmission poles in the forest.**] *Schweiz. Z. Forstw.* 104 (3), 1953 (79–83). [G.f.]

The principal requirements for scaffolding poles are that they should be slender, strong, and naturally durable (since they are not usually given preservative treatment). These qualities are more often found associated in suppressed than in dominant trees, and poles for this purpose should be taken from the understorey where the slower grown trees are thin for their age and have a high proportion of heartwood. For telegraph or transmission poles an important requirement is ease of preservative treatment, which is largely a function of the proportion of sapwood. These poles should be taken from among the dominants and co-dominants.

3807. **Engineering Reference Sheet No. 51–25. Southern Yellow Pine pole data.** *Electrical World, New York* 136 (13), 1951 (110). L.S.

Three tables giving length, circumference at top and at 6 ft. from butt, setting depth, and weight with

creosote, for various classes of poles up to 15 KV. transmission (an arrangement from construction standards of Gulf States Utilities Co.).

3808. Rees, L. W. **The strength of Northern White Cedar [*Thuja occidentalis*] posts.** *Minn. For. Notes* No. 15, 1953. pp. 2.

A study of 371 posts of 3·0 to 7·0 in. top diam., correlating this with heartwood diam. at ground line and deriving curves showing % loss in strength due to complete sapwood decay. Preservative treatment of small (3- to 4-inch) posts is essential.

832. *Mills, Their Functions and Products*

832.1. Sawmills and Planing Mills

See also Nos. 3412, 3777–87.

3809. **Recovery study made on Sugar Pine snags at mill.** *Timberman* 54 (8), 1953 (151).

In a mill study it was found that snag logs [standing dead trees] can be cut at a profit if stumpage rates are kept low and fixed separately from green timber. Cull totalled 34%, compared with a continual average cull and breakage factor of 4–7% for normal timber. The net volume cut at the sawmill during the study dropped from the normal 75,000 ft. to 67,000 ft./day. Hidden defects were numerous and caused considerable degrading; much of the defect was apparent only after seasoning and surfacing. Figures showing the sawmill lumber tally, sawmill recovery, dry recovery and normal recovery for different grades are tabulated.

832.2. Veneer and Plywood Mills, including the Manufacture of Composite-Wood Assemblies

See also Nos. 3704–5, 3733, 3790 *et seq.*, 3819, 3824–5, 3833, 3860, 3868, 3901–3.

3810. Aschner, E., and Kritchman, M. **Israel's plywood industry uses African hardwood.** *Lumberm.* 80 (4), 1953 (117, 119).

Gives figures for total production and for production by individual plants for domestic and foreign markets.

3811. Miller, D. G. **A preliminary investigation of veneer cutting properties of Aspen Poplar.** *Mimeo. For. Prod. Lab., Can.* No. *O*–167, 1952. pp. 9 + 5 photos + 3 dgms.

In tests on a small shipment of logs of *Populus tremuloides* optimum lathe settings (knife angle 90° 30′ and 90° 0′, horizontal opening of pressure bar. 0·058 and 0·115 in. and horizontal opening 0·016 and 0·032 in. for $\frac{1}{16}$-in. and $\frac{1}{8}$-in. respectively) were determined. In tests on 8 representative bolts yields of 70% of the log volume were obtained, 49% grade 1, 21% grade 2 and 30% grade 3. The veneers dried and glued satisfactorily.

3812. Keylwerth, R. Furnier-Trocknungsversuche. **[Experiments on veneer drying.]** *Holz Roh- u. Werkstoff* 11 (1), 1953 (11–7). 4 refs. [G.g.] P.R.

Presents results of drying *Fagus sylvatica* veneer from ca. 80% initial moisture content. The equation developed by Peck, Griffith and Nagaraja Rao (cf. *For. Abstr.* 14 (No. 3908) has been found applicable to veneer drying, the constants M (depending on the m.c. of wood) and n (mainly depending on thickness) being determined experimentally. The equation enables the effects of various factors to be described. The considerable effect of air velocity on drying time is to be explained by the increase of the heat transfer number with air velocity ($\alpha \propto v^{0.8}$). Analyses the relationships between air temperature and humidity on the one side, and heat transfer and drying time on the other. Investigations on the effect of veneer thickness show that the drying rate depends not on u (moisture concentration) but on u^n. Discusses contact drying, and tabulates data obtained for the drying of 1-, 2-, and 3-mm. veneers at 110, 130, and 145° C. by means of hot plates. The drying time is much shorter for the contact process than for convection drying.

3813. Alenius, N. R. Procédé de fabrication de plaques ou de bandes en bois par collage de planches, de lamelles ou de corps similaires en bois, ainsi que des plaques ou bandes en bois obtenues au moyen de ce procédé. **[Method of manufacturing wooden plates or strips by gluing together boards, laminae or similar wooden elements, and wooden plates or strips made by this method.]** *French Patent* No. 970,357, Jan. 3, 1951. pp. 2 + 2 dgms. [F.] P.O.

The boards or laminae are cut into rhomboids with an acute angle of ca. 45°, and then assembled edge to edge so that their longitudinal edges form an angle of ca. 45° with the longitudinal side of the plate or strip; two or more crossed layers of these assembled elements are glued together.

3814. Boehm, R. M. (to Masonite Corporation). **Process for making a plywood product.** *U.S. Patent* No. 2,557,071, June 19, 1951. pp. 6. P.O.

Wood veneers are first subjected to a hydrolysis treatment with steam at a pressure of not less than 200 lb./sq. in., and then arranged in a ply stack and subjected to heat and pressure (125–160 lb./sq. in.), the chilling taking place also under pressure (750 lb./sq. in.).

3815. King, E. P. **A new or improved stiff laminated sheet material.** *Brit. Patent* No. 684,086, Dec. 10, 1952. pp. 7. P.R.

A sheet material comprising a sandwich having a core between two outer layers of fibrous material, the core comprising a sheet or strip of (preferably light-weight) wood cut with the grain in the direction of the thickness of the sheet or strip and substantially perpendicular to its face, the outer layers being bonded to the faces of the sheet or strip by adhesive so that the grain of the wood extends substantially perpendicular to the outer layers.

833. *Timber in Buildings and Engineering Structures (Manufacture and Use)*

833.1. Building Components and Fittings: General

See also Nos. 3704–5, 3929–31.

3816. **Use of timber in all building work.** *Economy Memorandum, Ministry of Works, London* No. 4 (*n.s.*), 1952. pp. 12. Price 6*d.*

Discusses the use of softwood and hardwood, permitted quantities of softwood, design, the use of British Standards and Codes of Practice, lists of which are given in an appendix; lists restrictions on the use of softwood for different purposes; and tabulates figures showing limiting safe spans for joists, rafters, purlins and floor boards.

3817. **Diagram illustrating the use of Malayan timbers for building construction.** *Trade Leafl. Malay. For. Serv.* No. 14, 1952. Price 20 cents or 6*d*.

The diagram shows the details of building construction and lists timbers recommended for each (giving trade and vernacular names only) and for furniture.

3818. MIEDLER, K. A. **A contribution to tropical forest utilization: experience with Burmese timbers for housing.** *Unasylva* 7 (1), 1953 (3–9).

As a result of an FAO technical assistance mission to Burma, experiments were made with a number of secondary Burmese hardwoods, to explore possibilities of utilization in housebuilding. Three lines were followed: (1) artificial seasoning in a high-temperature, cross-draught drier, (2) impregnation with a new synthetic resin recently developed in Germany, and (3) manufacture of chipboards, using synthetic resin binders and a high-temperature (130–140° C.) press [cf. *For. Abstr.* 14 (p. 240)]. Promising results were obtained in all three directions. In general it was proved that the tropical woods tested were very suitable for the production of chipboards; in particular, the shrinkage in thickness of such boards when made of a mixture of lighter and heavier woods averaged only 7%, or less than half the average contraction of boards made from European woods. Boards made from *Lagerstroemia tomentosa* (which has a sp. gr. of 0·67) had a sp. gr. of 0·64 and the surprisingly small average shrinkage of 3·2%. This can be partly explained by the fact that certain species of Burmese wood seem to have particularly good capacity for absorbing the synthetic resin. Notes are given on the construction of a model house from these boards.

3819. EGUND, K. F. Nyere anvendelser av krydsfiner i byggeriet. **[Modern uses of plywood in building constructions [: an account of developments in the U.S.A.].]** *Repr.* from *Trœindustrien* 2 (8; 9), 1952. pp. [10]. 22 refs. [Dan.] P.R.

3820. KATO, S., and WADA, Y. **[Study of a composite wood/concrete T-beam bridge.]** *Bull. Tokyo Univ. For.* No. 39, 1951 (81–90). 6 refs. [E.jap.]

Presents the results of laboratory experiments on the applicability of formulae developed recently by Japanese engineers to composite wood/cement (C.W.C.) bridge design. The model bridge was of the T-beam type with wooden web and a concrete flange, each having alternate rectangular projections ('teeth') and recesses by which the two members are keyed together. It was found that both the adhesive strength between the wood and the concrete, and the effect of nails used at the tooth connexions to reinforce the union between wood and concrete, could be neglected in general calculation. The span/depth ratio of C.W.C. beams should not be less than 8. The greater the spacing of the wood and concrete 'teeth', or the greater their height, the greater was the deflection of the beam. Use of dry timber (moisture content 14–22%) for the web, by removing water from the concrete, reduced the latter's strength. Tests on bridge models, each consisting of 3 wooden webs united by a single concrete slab showed that: (1) the ultimate strength of the C.W.C. bridge was more than 1½ times that of a comparable all-wood bridge; (2) the flexural rigidity of the C.W.C. bridge was far greater than that of the all-wood bridge, and (3) the theoretical formulae derived for the C.W.C. beams were applicable in practice.

3821. **T.D.A. standard truss, type B, to take suspended ceilings.** *Design Sheet Timb. Developm. Ass., Lond.* Nos. 15–19 [*n.d.*]. Each pp. 1 + 1 dgm. P.R.

3822. LIIRI, O. Puuovien ominaisuuksista ja niiden tutkimisesta. **[The properties and testing of wooden doors.]** *Pap. ja Puu* 35 (3), 1953 (85–92). 2 refs. [Fi.e.] P.R.

Results of compression tests and tests of swelling and distortion on exposure to moisture cycles for different types of door are discussed and shown in graphs.

3823. YOUNGQUIST, W. G. **Thin, face-nailed hardwood strip flooring.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1925, 1952. pp. 4 + 6 photos. P.R.

An illustrated description of flooring consisting of face-nailed $\frac{5}{16}$-in. thick, 2-in. wide Red or White Oak strips.

3824. ÉTABLISSEMENTS HENRI LAURENT. Panneau composé pour le parquetage des appartements. **[Compound panel for parquet flooring in dwellings.]** *French Patent* No. 970,027, Dec. 28, 1950. pp. 2 + 4 dgms. [F.] P.O.

3825. VALENTIN, B. Panneau composé, notamment pour parquets. **[Compound panel, in particular for parquetting.]** *French Patent* No. 970,083, Dec. 29, 1950. pp. 2 + 4 dgms. [F.] P.O.

833.4. Special Uses in Agricultural Structures

3826. DOYLE, D. V. **Research in wind-resistant farm building constructions.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1930, 1952. pp. 8 + 1 photo, 4 dgms. 11 refs. P.R.

834. *Shingles. Cooperage. Packing Containers*

See Nos. 3770, 3868.

835. *Industrial and Domestic (Utility) Woodware. Toys and Models. Sports and Recreational Goods. Musical, Scientific and Mathematical Instruments. Surgical Uses etc.*

3827. CLARKE, L. N. **Timbers for battery separators.** *Bull. Commonw. sci. industr. Res. Organ. Aust.* No. 271, 1953. pp. 28. 12 refs.

Forty species from Australia and the S.W. Pacific area were tested for electrical resistance, Mn content,

dimensional changes, handling properties, flexibility angle and breaking radius, and the effect on mechanical strength of treatment with acid, and were given life and service tests. Tabulated results show that only 7 species are thoroughly satisfactory. These are: *Agathis palmerstonii* and *A. microstachya*, *Araucaria bidwillii*, *Phyllocladus rhomboidalis*, *Araucaria cunninghamii*, *Dacrydium franklinii* and *Araucaria klinkii*. *Pinus radiata* was satisfactory in a life test, and its suitability should be tested commercially. *Dyera costulata* gave good results in a limited life and service test, but because of mechanical weakness would need extended service tests. *Athrotaxis selaginoides* proved suitable only for stationary batteries because of low resistance to mechanical abrasion. *Daphnandra micrantha*, *Agathis macrophylla* and *Sloanea woolsii* would probably justify further testing if supplies of the more suitable species were short.

3828. Greenhill, W. L., and Chase, G. A. **Australian woods for textile rollers: some experiments on a flax spinning system.** *Wood* 18 (1), 1953 (12–4). [Commonwealth Scientific and Industrial Research Organization, Australia.]

Results of investigations on the rate and uniformity of wear, the formation of grooves, and the tendency to chip, the frequency of cleaning and of regrinding, and the smoothness of the surface after grinding, of a number of Australian species are tabulated and compared with English Sycamore and Canadian Rock Maple. Rollers built up from segments gave better results than those laminated from flat boards; the difficulty of seasoning solid blanks makes the use of fabricated rollers almost imperative. Of the Australian woods, *Endiandra palmerstonii* gave outstanding results on the spreadboard (the first stage of the operation) but is difficult to machine. *Flindersia brayleyana* was generally satisfactory, is in reasonably good supply, gives little trouble in seasoning, and machines well, but is not as serviceable as Rock Maple. Neither *Tristania conferta* nor *Nothofagus cunninghamii* was found particularly good for constructing pressing rollers. Further experiments will be made on other Australian species.

3829. Johnston, D. D. **Some experiments on the drying of Birch for brush woodware.** *Wood* 17 (10), 1952 (378–81).

In experiments at Princes Risborough the following results were obtained: (1) Birch poles cut to 6-ft. lengths were kiln-dried in 7 weeks to 15–20% moisture content, without excessive splitting, but the irregular shape and size of the poles caused waste of space in the kiln and this with the long period of drying would make the process too expensive. (2) Short lengths reduced to a roughly octagonal shape and dried to 20% in 3 weeks, suffered from end checking and radial splitting, the majority being ruined. Soaking the pieces for 24 hours in urea followed by a mild kiln-drying schedule of 2–3 weeks reduced splitting, but the cost of the process was considerable, while checking and splitting became serious when the pieces were soaked for a shorter time, dried more quickly or left to air-dry in a drying shed. (3) Fully shaped brush-heads soaked for 6 hours in urea solution and kiln-dried for 6–7 days, or air-dried under cover for a period varying with the weather, showed very little checking, and only minor shrinkage and distortion. There was a superficial discoloration, easily removed by the final sanding. This method is promising and would probably result in considerable savings, but further large-scale trials are necessary.

3830. Pejoski, B. Šimšir i njegova upotreba. [***Buxus sempervirens* and its use.**] *Šumarstvo* 5 (2), 1952 (136–41). 4 refs. [Serb.f.]

Gives some account of the natural habitat of *B. sempervirens*, which seldom exceeds 5 m. in height and 10 cm. in d.b.h., in Jugoslavia, and describes the manufacture of Boxwood spoons in the village of Sedlarevo in Macedonia, where the annual production before the war was ca. 60,000, and is to-day ca. 40,000. No fewer than 10 different hand tools are used in spoon manufacture.

3831. Brown, N. C. **Wood in sport.** *Wood* 18 (6), 1953 (216–7).

A brief account of the manufacture of rackets, skis, golf heads, baseball and softball bats, bows and bowling alleys and pins, and the species used, with figures for the amount of wood used for these items in the U.S.A. and its value.

836. *Furniture and Cabinet-Making. Carving. Marquetry. Wooden Ornaments*

See also No. 3817.

3832. Pittman, H. B., Jr., and Johnson, E. S. **Cost savings in furniture manufacture by accurate dimensional control.** *Bulletin, Department of Engineering Research, North Carolina State College, Raleigh, N.C.* No. 53, 1952. pp. i + 53 + 28 tbls. 9 refs. P.R.

Shows that it is desirable to establish dimensional tolerances in furniture manufacture and maintain them by using gauges. This method of dimensional control should be followed by other systems of scientific management, operating in conjunction with the gauges. Presents two methods of gauging: (1) individual gauges for length and width of each part of each piece, and (2) adjustable or universal gauges with dial indicators. By using gauges, a saving of ca. 8% may be effected in direct cabinet-room labour. For the average furniture plant, a system of individual gauges would cost ca. $4600 per year; for adjustable gauges, the annual cost on a 5-year basis would not exceed $300.

838. *Vehicles (including Ships, Boats, Aircraft)*

3833. Samuel, R. **Laminated ship construction practices.** *J. For. Prod. Res. Soc.* 3 (1), 1953 (74–5, 82). P.R.

Describes the use of laminated Oak and Douglas Fir in the building of wooden mine-sweepers. [Cf. *For. Abstr.* 14 (p. 125).]

839.8. *Industrial Waste Wood and its Uses*

See also Nos. 3947, 3950–1, 3953–4.

3834. Hanssen, L. J. **Sawmill waste as fuel.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No.

1723, 1952. pp. 11 + 8 dgms. Transl. by P. A. Gibson from *Norsk Skogind.* 5 (10), 1951 (303–8). [Cf. *For. Abstr.* 13 (No. 2527).]

3835. Rees, C. **The handling of wood fuel.** *J. For. Prod. Res. Soc.* 3 (1), 1953 (61). P.R.

Describes with illustrations blower systems for collecting and handling small-particle dry wood waste from all types of woodworking machines and from hog and hammer mills.

3836. Mésanguy, M., Kraffe de Laubarède, L., and Frick, M. Composition pour la préparation d'agglomérés de sciure combustibles et produit obtenu. **[Binder for sawdust fuel briquettes.]** *French Patent* No. 980,339, May 10, 1951. pp. 2. P.O.

A mixture of plant mucilage, Na_2CO_3, colloidal clay, and either trioxymethylene or *o*-oxybenzoic acid or *p*-oxybenzoic acid.

3837. Strudel, J. Verfahren zur Herstellung von Brennkörpern. **[Method of manufacturing fuel briquettes.]** *German Patent* No. 823,734, Dec. 6, 1951. pp. 2. P.O.

The briquettes are made from forest waste, especially conifer needles, with or without comminuted wood, straw, coal-dust, or peat, using organic binders.

3838. Clark, W. H. D. **Design and operation of [steam-generating] furnaces for burning bark and wood.** *Pulp Paper Mag. Can.* 54 (4), 1953 (96–100).

3839. Lorenzi, O. de. **Turbulent suspension burning as applied to steam generating units for paper mills.** *Tappi* 36 (3), 1953 (97–102). 3 refs. P.R.

Discusses recent furnace designs in which primary fuels are wet wood and similar types of cellulose refuse and which embody the principle of flash drying (a process in which wet material is dispersed in a stream of heated gas, so that a major portion of the moisture is flashed into vapour and carried off by the gas stream). A detailed description is given of a unit installed for a large paper mill, which has been in continuous use for 20 months [cf. *For. Abstr.* 13 No. 4312)]. Considerable operating data now available confirm the effectiveness of the method. A motion picture of actual furnace-operating conditions shows the effective flash drying and devolatilization obtained through use of suspension burning in a highly turbulent furnace operation.

3840. Swanson, R. E. **Wood-waste mulches in Hawaii.** *Soil Conserv.* 18 (11), 1953 (243–5).

Notes on the use of sawdust as a mulch in flower and vegetable growing in Hawaii, which is said to reduce watering by up to 70% and also to reduce weeding time.

3841. Snow, E. A. **Oak slabs and cordwood as a source of tannin and pulp.** *Journal of the American Leather Chemists' Association, Easton, Pa.* 47 (8), 1952 (563–77). 16 refs. L.S.

Presents results of a pilot-plant study made at Norris, Tenn., by TVA, to determine the feasibility of separating the bark from wood in chipped Oak waste (*Quercus velutina, Q. alba,* and *Q. montana*) prior to extraction, primarily in order to lower the price of tannin extract. The process included chipping and screening operations followed by separation on a specific-gravity type, air-float separator. Raw materials tested included mixed Oak slabs, edgings, and cordwood. Edgings proved inferior to slabs because they could not be chipped satisfactorily. Separation was not as efficient on cordwood as on slabs. The various fractions obtained by separation were re-combined according to their bark content into (1) a bark product for tannin extraction, and (2) a wood product for pulping. The former was found to contain sufficient tannin to justify commercial extraction. Pulping tests on the wood product showed that it would be economically feasible to produce an acceptable corrugating board from it.

3842. Rennenkampf, W. von. Procédé de fabrication d'un corps aggloméré à base de bois et de liant minéral et produits obtenus par ce procédé. **[Method of manufacturing a compound material from wood and mineral binder.]** *French Patent* No. 988,240, March 29, 1951. pp. 3. [F.] P.O.

Wood chips less than 0·5 cm. thick are treated with solutions of NaCl, $MgCl_2$, $CaSO_4$, and NH_4Cl (at a later stage also with a solution of NaOH) to remove the soluble constituents of the sap and replace them with hydrophobic substances, as well as to impart a good contact with the hydraulic mortar with which the treated wood is mixed. A kind of porous concrete is obtained.

3843. Agueros, G. **Adobe composition and method.** *U.S. Patent* No. 2,569,272, Sept. 25, 1951. pp. 6. P.O.

An adobe block is obtained by preparing an emulsion of asphalt in water, mixing it with an adobe clay to form a mud, soaking sawdust in water for 24–48 hours, mixing swollen sawdust with the mud, pouring the mix into a mould, and drying.

84. PRESERVATION AND OTHER TREATMENTS TO IMPROVE THE PROPERTIES OF WOOD. DAMAGE BY BIOLOGICAL AGENCIES AND ITS CONTROL. SEASONING. TIMBERYARD PRACTICE

3844. Muthig, J. Verwendung von Ultraschall zur Schädlingsbekämpfung an Nutzholz. **[Use of ultrasonics for pest control in timber.]** *German Patent* No. 831,767, Feb. 18, 1952. pp. 3 + 4 dgms. [G.] P.O.

Poles or sleepers, with or without previous application of a preservative, are treated with ultrasonics from a 1–2 KW. generator, using a transmitting liquid, the purposes being (1) destruction of the fungus and insect pests in the timber, and (2) promotion of diffusion of the preservatives into the wood.

841. *Wood Preservation*

See also Nos. 3412, 3717, 3732, 3874, 3877, 3888, 3890–1, 3899–3903, 3905–6.

3845. Vaughan, J. A., and Vinson, J. C. (to Southern Wood Preserving Co.). **Apparatus for partially dehydrating and cleansing oily wood preservatives.** *U.S. Patent* No. 2,603,588, July 15, 1952. pp. 6 + 5 dgms. P.O.

An apparatus embodying a special settling tank, for dehydrating and cleansing oil preservatives heavier than water.

3846. Österreichische Stickstoffwerke Aktiengesellschaft. Verfahren zur Konservierung bzw. Imprägnierung von Holz. **[Method of wood impregnation.]** *Austrian Patent* No. 173,851, Feb. 10, 1953. pp. 2. P.O.

Wood is treated with phenoxyacetic acids substituted in the phenyl radical (one or more H atoms being replaced by halogens, NO_2, or both) in the form of vapour, solution, dispersion, or solid.

3847. Rouzet, L. (to Société des Laboratoires de Recherches pour Applications Industrielles). **Wood preservative comprising chlorinated phenolics, anthracenic oils, and creosotes.** *U.S. Patent* No. 2,605,206, July 29, 1952. pp. 4. P.O.

An example is: 10% by weight coal-tar anthracenic cake, 3% naphthalene, 0·5% parachlormetacresol, and 86·5% fuel oil.

3848. Hamann, K., and Willems, J. Produit pour la préservation du bois. **[A wood preservative.]** *French Patent* No. 1,012,730, July 16, 1952. pp. 2. P.O.

A preservative, specially suited for wood embedded in soil, containing a water-soluble salt of pentachlorophenol in addition to other water-soluble (and oily) preservatives.

3849. Bavendamm, W., and Bellmann, H. Holzschutzmittel. SF-Salze. **[Wood preservatives. Silicofluorides.]** *Holz Roh- u. Werkstoff* 10 (12), 1952 (479–82). 25 refs. [G.] P.R.

3850. Bavendamm, W., and Bellmann, H. Holzschutzmittel. Chlornaphthalin - Präparate. **[Wood preservatives. Chloronaphthalene preparations.]** *Holz Roh- u. Werkstoff* 11 (2), 1953 (81–4). 24 refs. [G.] P.R.

3851. Scholles, W. Zur Frage der Salzsäureabspaltungen und Phosgenbildung bei hydrolytischer Beanspruchung und thermischem Zerfall von Chlornaphthalinpräparaten. **[Splitting off of HCl and formation of $COCl_2$ through hydrolytic and thermal decomposition of chloronaphthalene preparations.]** *Holz Roh- u. Werkstoff* 11 (2), 1953 (57–60). 5 refs. [G.g.] P.R.

Tests showed that the chlorinated naphthalenes (low-chlorinated naphthalene, known under the name of 'Xylamon') when free from any labile addition compounds, do not cause any corrosion due to the splitting off of HCl when brought in contact with water, wood and steel. No $COCl_2$ could be detected when (1) wood saturated with Xylamon was ignited, (2) Xylamon in liquid form was decomposed by heat in air, or was oxidized with oleum.

3852. Inouye, Y., and Kuroki, Y. **[Studies on wood preservatives VII. The efficiency of chlorinated Pine root oil as a wood preservative.]** *Wood Res., Kyoto* No. 8, 1952 (74–82). 9 refs. [Jap.e.]

Wood blocks were used to test the effectiveness of chlorinated Pine root oil, creosote coal tar, pentachlorophenol and its Na salt. Different species exposed to *Irpex consors* or to *Lenzites subferruginea* for 3 months were tested for compressive strength; and those exposed to *I. consors* for 1 month, for impact strength. Results show that, leaching apart, the preservatives are almost equally effective. [Cf. *For. Abstr.* 14 (No. 1638).] *From authors' summary.*

3853. Peter, O. Prüfung der Sublimateindringung bei der Holzimprägnierung mit Röntgenstrahlen und künstlichradioaktivem Quecksilber. **[Tests on the penetration of $HgCl_2$ into wood during impregnation, with the aid of X-rays and artificially radioactive Hg.]** *Holz Roh- u. Werkstoff* 11 (2), 1953 (50–4). 10 refs. [G.g.] P.R.

Besides the known concentration gradient of $HgCl_2$ in the peripheral layer (the concentration decreasing steadily from periphery toward core), X-ray tests on kyanized Spruce and Pine have disclosed single threads with a very high $HgCl_2$ concentration, the thread dimensions being ca. 0·01 cm. diam. and the length up to 5 cm.; an explanation of this phenomenon is suggested. During the 'warm' process (24 hours at 40° C. followed by 120 hours at normal temperature), early wood absorbs more $HgCl_2$ than late wood. Auto-radiographs obtained by using $Hg^{203}Cl_2$ have shown for Spruce an exponential decrease of concentration toward the core. Addition of NaCl is almost witout effect in Spruce, but considerably increases the depth of penetration in Pine.

3854. Herzig, J. Tränkversuche an saftfrischen bis lagertrockenen Fichtenmastenabschnitten mit verschiedenen Tränkflüssigkeiten und Tränkverfahren als Funktion der Lagerzeit. **[Tests on the relationship between the period of storage and the behaviour of Spruce pole sections, from green to storeroom dry, when impregnated with different liquid preservatives, using different methods.]** *Holz Roh- u. Werkstoff* 11 (2), 1953 (60–4). [G.g.] P.R.

Results show that the amounts and depths of absorption of UA [Wolman] salts increase as the moisture content of wood decreases, whereas the amounts and depths of absorption of coal-tar oil decrease under the same conditions. In air-dry condition, the salts always penetrate deeper than the oil. The amounts and depths of absorption depend more on moisture content than on the oven-dry density of wood. The closing of pits begins in Spruce wood probably at 50–75% m.c., thus hindering the penetration of preservatives, particularly oily preservatives.

3855. Holmgren, H. Om impregneringens beroende av furuvirkets förbehandling med hänsyn till barkningsmetoder och vattenläggning. **[The effect on the impregnation of Pine wood of barking methods and storage in water.]** *Årsb. svenska Flottledsförb.* No. 26, 1952 (4976–82). 2 refs. [Sw.]

Material, diam. 4–7 in., felled from a 40-year Pine stand in March-April, was barked, (1) removing all the outer and a large part of the inner bark, (2) during the period of sap flow in early summer when the bark is easily removed, and (3) removing all bark and phloem as well as at least the outermost annual ring. Half the material in each group was kept in water for a month, in June 1950. All the material was impregnated with creosote or Boliden salt by vacuum pressure in the summer of 1951. Uptake of preservative in kg. and in litres/cu.m. for 5, 30 and 120 min. pressure treatment, is shown in graphs and tables. There was no significant difference between

the different barking methods, but wood that had been stored in water took up considerably more preservative than that kept dry throughout, especially for the 5-min. pressure treatment, when the difference was as much as 50%, and for impregnation with creosote. The uptake per volume of sapwood was not affected by sapwood content within the range 70–100% sapwood. The impregnated poles are being used in field tests; no decay was found at the first inspection, after 9 months.

3856. **Preserving wood poles. Outcome of an experimental investigation.** *Electrical Review, London* 152 (14), 1953 (739–41). P.R.

A line of creosoted Redwood poles which had started to decay was divided into two groups, one of which was treated by the 'Cobra' process in 1947. Some of these poles have recently been examined to test the extent of the diffusion of preservative into uncreosoted sapwood. Test disks exposed to fungal attack showed that the "Cobra" salts had diffused into uncreosoted sapwood in the interior of the pole and protected it against decay.

3857. KRZYZEWSKI, J. **The hot-and-cold bath preservative treatment of Jack Pine and Spruce crossarms with pentachlorophenol solution.** *Mimeo For. Prod. Lab. Can.* No. *O*-166, 1952. pp. 5 + 4 plates.

Tests were made on 15 Jack Pine and 4 Spruce cross-arms. Results for Jack Pine were satisfactory, but the method cannot be recommended for Spruce, as absorption and depth of penetration were not adequate. Net retention was not much increased by prolonged periods (up to 96 hr.) in the cooling bath.

3858. COLLEARY, M. J. **The preservative treatment of fence-posts by non-pressure processes.** *Bull. For. Br. Can.* No. 107, 1952. pp. 28.

A survey of preservatives, preparation, methods, equipment and costs.

3859. MEEK, W. L., CURTIN, T. W., and WALTERS, C. S. **Report on project 301-A. Preservative treatment of fence posts by cold-soaking in pentachlorophenol fuel-oil solutions.** *For. Note Ill. agric. Exp. Sta.* No. 33, 1953. pp. 4.

Cf. *For. Abstr.* 13 (No. 3409).

3860. SAVAGE, F. L. **Creosoted plywood.** *J. For. Prod. Res. Soc.* 3 (1), 1953 (34–5, 80). P.R.

Makes recommendations for retentions for creosoted Douglas Fir plywood in Canada and gives details of service performance of such plywood in marine uses [cf. *For. Abstr.* 13 (No. 2550)]; with discussion.

3861. THEDEN, G. Ergebnisse mykologischer Holzschutzmittel-Untersuchungen nach abgewandelten Prüfverfahren. **[Results of mycological investigations on wood preservatives using modified testing methods.]** *Holz Roh- u. Werkstoff* 11 (2), 1953 (41–5). 9 refs. [G.g.] P.R.

Describes the 'match-stick' method developed by the author to save time and expense. The culture vessels used are ordinary test-tubes of 16 × 1·6 cm. The fungi are grown on a 10 × 0·8 cm. piece of Spruce-pulp felt-board impregnated with malt extract and 0·5% $(NH_4)_2HPO_4$. The test specimens are 'match-sticks' of 5 × 0·7 × 0·4 cm. Tests with *Coniophora cerebella* and *Poria vaporaria* lasted for 6 weeks at 28° C. Leaching lasted for 14 days, using double the amount of water required by the standard method. The total time for the author's method, however, is about half, viz. 8 weeks without leaching, and 11 weeks with leaching. Comparative tests of the two methods, showed that the 'threshold' values of preservatives generally differed, but were easier to determine for the 'match-stick' method, and the weight loss, as could be expected, was much more pronounced for the new method.

Describes also the (as yet uncompleted) tests of different aqueous and oily preservatives applied on the surface only (brushed or painted over) in accordance with German Standard 52,176. Results to date show that wood-destroying fungi are able to penetrate the coated external layer and cause interior decay.

3862. THEDEN, G., and STARFINGER, K. Versuche mit einem abgewandelten Laboratoriumsverfahren zur kurzfristigen Prüfung der pilzwidrigen Wirksamkeit von Holzschutzmitteln. **[Tests with a modified laboratory method for rapid testing of the fungicidal effect of wood preservatives.]** *Holzforschung, Berlin* 6 (4), 1952 (105–10). 12 refs. [G.g.e.] P.R.

A slightly more detailed description of the 'match-stick' method. [Cf. preceding abstract.]

3863. HOLMGREN, H. F. Erfahrungen mit Feldversuchen an Holzschutzstoffen in Schweden. **[Experience from field tests on wood preservatives in Sweden.]** *Holz Roh- u. Werkstoff* 11 (2), 1953 (70–2). 3 refs. [G.g.] P.R.

Systematic field tests began in 1941. Most of the test plots are in South Sweden. The species tested is almost exclusively *Pinus sylvestris*; test logs are 150 cm. long, and 15–25 cm. diam. of which ¼ is heartwood; the scantlings are sawn to 2 × 5 × 50 cm. from sapwood so that the annual rings lie parallel to the 2-cm. face. Some results of 9-year tests are graphed for Basilit UA, Boliden, and creosote oil.

3864. STEINWEDE, A. Die Lebensdauer von Holzschwellen. **[Service life of wooden sleepers.]** *Holzschwelle, Düsseldorf* No. 3, 1952 (1–12). 10 refs. [G.] P.R.

The service life of Pine, Oak and Beech sleepers impregnated with coal-tar oil averages in Germany 27, 28, and 35 years, respectively, when the standard method of attachment is used; with improved methods, these figures increase to 30, 32, and 40.

842. *Treatments to Improve the Resistance of Wood to Physical and Chemical Agencies other than Fire*

See also Nos. 3715, 3737, 3801, 3818.

3865. COX, E. P. (to The Champion Paper and Fibre Co.). **Wood fiber base material and process for making the same.** *U.S. Patent* No. 2,581,635, Jan. 8, 1952. pp. 10. P.O.

The non-cellulosic constituents are removed from wood of small and uniform thickness by subjecting

it to the usual chemical treatment applied in pulping. The form and integrity of the wood pieces, and the fibre orientation and arrangement are preserved. The pieces are then impregnated with phenol-formaldehyde resin to make a product containing 60–90% cellulose (dry-weight %), the resin making up to 100%. The product is then cured by applying heat and pressure.

3866. Fieguth, E. Verfahren zur Veredelung, insbesondere zur Verfestigung von Holz und anderen Faserstoffen. **[Method of improving, in particular increasing the strength of, wood and other fibrous materials.]** *German Patent* No. 832,488, Feb. 25, 1952. pp. 3. P.O.

The wood is impregnated with 5–10% NaOH solution at 15–20° C., the dissolved incrusting substances are washed out with water at ca. 20°, and the wood is then air-dried.

3867. Gesellschaft für Holzveredelung m.b.H. Verfahren zum Veredeln von Holz und daraus hergestellten Gegenständen. **[Method of improving wood and wooden articles.]** *German Patent* No. 837,925, May 2, 1952. pp. 4. P.O.

The wood is impregnated with aqueous solutions of low polymers of synthetic resins obtained from an aldehyde (formaldehyde) and dicyandiamide or urea, in a neutral medium, and condensing them in or on the fibres.

3868. Garlick, G. G. **Package durability through preservative treatment.** *J. For. Prod. Res Soc.* 3 (1), 1953 (39–40, 80–1). P.R.

Boxes of Douglas Fir plywood were treated with Wing sealer, or with a good water-repellent preservative or left untreated, and a bright tin can was placed in the middle of each box and packed round with newspaper. The boxes were exposed to the weather for 18 months. At the end of the test, untreated boxes and boxes that had been dipped in sealer were in bad condition, the paper was wet and mouldy, and the cans were rusty, while the insides of the boxes treated with water-repellent preservative, and their contents, were dry and in good condition. Similar results were obtained with small boxes with sealed ends tested for shorter periods, and boxes of solid Pine and hardwood lumber.

843. *Fireproofing and Fire Resistance*

3869. Clarke, S. H. **The fire retardant treatment of textiles and timber.** *F[ire] P[rotection] A[ssociation] Journal Reprint, London* No. 8, 1951. pp. 11. 11 refs. P.R.

Published originally in *F.P.A. Journal, London* No. 9, April, 1950. Discusses various treatments and tests for treated materials.

3870. Hird, D., and Simms, D. L. **Fire retardant treatments.** *Wood* 18 (3; 4), 1953 (92–5; 134–7). 15 refs.

Discusses the process of ignition and spread of fire, the effect of different fire-retardant processes, the relative value of different retardants in delaying ignition, and a number of tests and results obtained.

3871. Hird, D., and Simms, D. L. **Fire retardant treatments; a critical examination of the effects of fire-retardant treatments on the fire hazards of wood.** *Wood* 18 (5), 1953 (176–7). 6 refs.

Discusses the spread of fire between buildings and lists a number of tests used.

3872. Daimler, K., and Lorenz, V. (to Farbwerke Hoechst). Feuerschutzmittel. **[Fireproofing agents.]** *German Patent* No. 827,861, Jan. 14, 1952. pp. 2. [G.] P.O.

Consisting of water-soluble alkaline salts of β-naphthol, preferably with the addition of wetting agents.

3873. Amai (Société à responsabilité limitée), and Tripet, R. Procédé d'ignifugation résistant à l'eau, composition ignifugeante et produits obtenus. **[Water-resistant fireproofing agents.]** *French Patent* No. 977,545, April 2, 1951. pp. 3. [F.] P.O.

Objects are treated with a solution of the fireproofing agent and of another substance that reacts with the first to form a water-repellent coat, the treatment being conducted either in one bath or in two successive baths. Wooden boards are brushed thrice with a 5% Na silicate solution, air-dried overnight, and immersed for 6 hours in a saturated solution of $NH_4Al(SO_4)_2.12H_2O$.

844. *Attack by Plant Organisms*

See also No. 3388.

844.1. Sap-staining Fungi

3874. Bellmann, H., and Francke-Grosmann, H. Versuche zur Tränkfähigkeit verblauten Kiefernsplintholzes. 1. Mitteilung: Tränkung mit öligen Imprägniermitteln. **[Tests on the ease of impregnation of bluestained Pine sapwood: 1. Impregnation with oily agents.]** *Holz Roh- u. Werkstoff* 10 (12), 1952 (456–63). 20 refs. [G.g.] P.R.

Presents the results of tests on Pine sapwood specimens, first treated with different bluestain fungi (*Ophiostoma ips*, *O. clavatum*, *O. canum*, *Trichosporium tingens*, *T. tingens* var. *macrosporum*, and *Leptographium lundbergii*), and then pressure-impregnated with coal-tar oil. Scantlings 3 × 3 × 20 cm. or discs 3 cm. thick were sawn from green wood, air-dried to 110–120% moisture content, and then inoculated with spores of pure cultures following a 10-min. sterilization in steam. After 6 weeks at 22° C. the specimens were covered with a thick layer of bluestain hyphae; they were then kept for 2–3 weeks in contact with the outer air until the m.c. fell to 14–15%. The specimens were then sawn into 2 × 2 × 3 cm. blocks. With the ordinary Rüping process (coal-tar oil at 120° and 2 kg./sq. cm. for 2 min.) the average values of penetration in the radial direction (for the 6 fungi used) were 40–440% higher than for control blocks subjected to a pressure of 8 kg./sq. cm. for 5 min. Whereas in wood without bluestain the preservative penetrates mainly into late wood, leaving early wood untouched, bluestained specimens show considerable penetration into the early wood, the degree varying greatly with different species of fungi. Under uniform conditions of impregnation (coal-tar oil, 100°,

8 kg./sq. cm., 5 min.) specimens of bluestained (*Ophiostoma clavatum*) wood having moisture contents varying from 80 to 10% showed a steady rise in penetration as the m.c. fell from 80% to 30–35% (fibre-saturation point), then a very steep rise to ca. 25% and thereafter a resumed steady rise. The final conclusion is that although bluestain hinders penetration of oil preservatives at high moisture contents, it promotes impregnation when the m.c. is low, i.e. below the fibre-saturation point. Bluestain fungi can live in wood when the m.c. is 30% or more, dying out at ca. 22%.

3875. Radvan, R. Vodní provoz ve dřevě, napadeném houbou *Ceratostomella pilifera* Fries. **[Movement of water in wood attacked by *C. pilifera*.]** *Spisy Vydávané Prírodovědeckou Fakultou Masarykovy University, Brno* No. *K*3/326, 1951 (63–78). 16 refs. [Cz.cz.russ.e.] L.S.

The results of tests on Pine sapwood blocks (6 × 14 × 48 mm.) show that (1) when the relative humidity of the air is low and the moisture content of the wood favours the development of wood-destroying fungi, or when the r.h. is higher but the m.c. is lower, wood with living *Ceratostomella* dries more slowly and wood with dead *Ceratostomella* more quickly, than sound wood; (2) when both the r.h. and m.c. are high, the reverse obtains.

3876. Radvan, R. Vliv houby *Ceratostomella pilifera* Fries na rozklad lignocellulosních blan dřevokaznými houbami. **[Effect of *C. pilifera* on the decomposition of lignocellulosic membranes [cell walls] by wood-destroying fungi.]** *Spisy Vydávané Prírodovedéckou Fakultou Masarykovy University, Brno* No. *K*3/326, 1951 (79–96). 13 refs. [Cz.cz.russ.e.] L.S.

Tests were made on Pine sapwood blocks (6 × 14 × 84 mm.), (*a*) containing living *Ceratostomella*, (*b*) containing dead *Ceratostomella*, and (*c*) sterile. When exposed to *Lenzites* infection, decay occurred at about the same rate in (*b*) and (*c*), but in (*a*) it was slow at first and then more rapid. *Coniophora* caused the most rapid decay in (*b*), slower in (*c*), and slowest in (*a*). *Fomes marginatus* decay was initially at the same rate in all three groups, but after ca. 35% of the wood had been destroyed, (*b*) decayed most rapidly and (*a*) the slowest.

3877. Schulz, G. Versuche über Bläueschutzbehandlung von Kiefernstamm- und Schnittholz. **[Tests on the protective treatment of Pine logs and sawn timber against bluestain.]** *Holz Roh- u. Werkstoff* 11 (2), 1953 (66–8). [G.g.] P.R.

Presents some results of field tests made in 1951 to establish correlation between toxic values ('mycocidal threshold values') found in field tests and those obtained in laboratory tests by the author's sapwood-disc method [cf. *For. Abstr.* 13 (No. 4335).] For freshly sawn boards in a mill, very good quantitative agreement with laboratory results was obtained. Logs seem to require ca. 10 times greater concentration of preservatives to secure immunity from bluestain. The numerical results are given for Na pentachlorophenate, although several proprietary preservatives were tested.

844.2. Wood-destroying Fungi

See also Nos. 3073, 3448, 3478–85, 3808, 3861–2, 3876, 3921, 3933.

3878. Knodel, H. Zur Frage der Unterscheidung der Schwammschäden nach holzzerstörenden Pilzen. **[The distinguishing of fungal damage done by different wood-destroying fungi.]** *Holz Roh- u. Werkstoff* 11 (1), 1953 (9–10). [G.g.] P.R.

A discussion of general principles.

3879. Lohwag, K. Fäuletypen des Holzes. **[Types of wood decay.]** *Holz Roh- u. Werkstoff* 11 (2), 1953 (54–7). 19 refs. [G.g.] P.R.

The generally accepted subdivision into stain, white-rot, and brown-rot fungi can serve as a basis for the classification of the wood-attacking fungi. In doubtful cases a differentiation between the white-rot ('corrosive', predominantly lignin-destroying) and brown-rot ('destructive', cellulose-destroying) fungi can be carried out by Bavendamm's physiological method. Different types of fungal attack are described. External similarities of 'red strip' (*Stereum sanguinolentum*), red rot (*Fomes annosus*) and the initial stage of *Lenzites* rot are stressed. In addition to the three main types of fungal attack, the author mentions the 'double rot' ('Pine-kernel rot') of *Stereum frustulosum* followed by *Polyporus sulphureus*.

3880. Pearl, W. L. **A method for the estimation of decay in Douglas-Fir wood chips.** *Tappi* 36 (3), 1953 (133–6). 6 refs. P.R.

Presents a method for the estimation of the amount and type of decay ('white-pocket' rot, 'brown' rot, and 'dote') in Douglas Fir wood chips. Including the time necessary for drying the sample, 36–48 hours are required to carry out the test; it is said to determine the relative amounts of the predominant type of decay within limits of 5–10%. The method is based on the colours of (1) the filtrate from a boiling-ethanol extraction of the ground sample, (2) the solution after boiling the ground sample in water for a given time (5 min.), and (3) the boiling-water extract after treatment with a small amount of caustic alkali.

3881. Matters, C. N., Costa, E. W. B. da, and Tamblyn, N. **Project P.11: The characteristics of Australian decay and stain fungi. Sub-project P.11–12: The identification of basidiomycete fungi in culture. Progress report No. 2. Morphological characters of 14 cultures of basidiomycetes.** Division of Forest Products, C.S.I.R.O., Australia. 1952. pp. 33 + 14 sets of photos + 5 sets of drawings. 13 refs.

Descriptions and illustrations are given of the macroscopic and microscopic features of 11 species and 14 cultures. Comparison with overseas descriptions to determine whether slight differences in technique materially affect the cultural characteristics, showed that descriptions of most species were closely comparable. *From authors' summary.*

3882. Krstić, M. Neke podloge za razvijanje miceliuma bukovih ksilofaga. **[Some culture media for mycelial development of [saprophytic] decay fungi**

of Beech wood.] *Rad. Inst. nauč. Istraž. šum., Beograd* No. 1, 1950 (129–41). 7 refs. [Serb.serb.f.]

3883. NARAYANAMURTI, D., GEORGE, J., and VERMA, G. M. Pilzamylase. [**Fungal amylases.**] *Holz Roh- u. Werkstoff* 10 (11), 1952 (428–32). 22 refs. [G.g.] P.R.

Presents results of an investigation of the activity of amylases obtained from *Polystictus sanguineus* and *Fomes lamaoensis*. The extracellular enzyme is more active than the intracellular; the activity of both increases with the age of the culture.

3884. NARAYANAMURTI, D., and VERMA, G. M. Cellulase und Invertase von *Polystictus sanguineus* und über die mögliche Wirkungsmechanik von Holzschutzmitteln. [**The cellulase and invertase of *P. sanguineus*, and the possible mechanism of action of wood preservatives.** *Holz Roh- u. Werkstoff* 11 (1), 1953 (7–9). [G.g.] P.R.

Presents results of experiments on the dependence of the activity of *P. sanguineus* invertase and cellulase on temperature, pH, enzyme concentration, and duration of the reaction. Results of tests on the effect of various poisons (aqueous extract of coal-tar oil, aqueous extracts of healthy and diseased wood, acetic-acid extracts of *Pinus longifolia* and *Shorea robusta* treated with 4% Ascu) on the activity of these carbohydrases are also given. In all cases the activity decreased as the amount of poison increased. Extracts from healthy wood were more toxic than those from diseased wood. The acetic-acid extracts of the two woods were found to inhibit the growth of fungi when used with traces of Ascu.

3885. KEINO, K. [**The effect of copper salts on the mycelial growth of wood-destroying fungi. II. The destruction of wood impregnated with copper salts by *Poria vaporaria* and *Trametes sanguinea*. III. Retention of the toxicity of copper salts against *Poria vaporaria*.**] *Bull. For. Exp. Sta. Meguro, Tokyo* No. 54, 1952 (1–44). 44 refs. [Jap.e.]

[Cf. *For. Abstr.* 14 (No. 779).] (II) Samples of *Pinus densiflora* were impregnated with ammoniacal $Cu(NH_3)_4SO_4$ solutions, at 0·6, 1·2, 2·5, 5·0 and 10% concentration, and set in cultures of *T. sanguinea* or *P. vaporaria* at 26° C. for 100, 200 and 300 days. The samples were analysed immediately after impregnation, during the drying after impregnation, at the fibre-saturation point, and during decay, to determine changes in the composition of the cupric-amino complex in the wood. After exposure to decay, the pieces were tested for loss of weight and compressive strength. The following results were obtained: (1) When $Cu(NH_3)_4SO_4 \cdot H_2O$ was dried for 24 hr. at 105° it lost NH_3 and water to become $Cu(NH_3)_2SO_4$. (2) When $Cu(NH_3)_2SO_4$ was kept in water for 5 days at room temperature, $(NH_4)_2SO_4$ separated out to give $CuSO_4 \cdot 10CuO$, considerable amounts of which were found in control samples impregnated with 5% solutions of $Cu(NH_3)_4SO_4$. (3) Some wood components were chemically decomposed by the $CuSO_4 \cdot 10CuO$ and perceptible amounts of oxalic acid were found. As a result, the compressive strength of control samples, apparently quite sound, decreased and the alkali extracts increased. Graphs showing the relationship of the treating concentration to alkali extract % and to the decreasing % of compressive strength are almost identical in shape. (4) Destruction of samples by *P. vaporaria* was accelerated with all solutions below 10%, while with *T. sanguinea* it was accelerated with the 0·6% solution only, and did not occur with solutions of over 2·5%. (5) Acceleration of fungus decay with concentrations below 1·2% appeared to be caused by the action of $(NH_4)_2SO_4$ separating out. (6) Acceleration of decay by *P. vaporaria* in 2·5- and 5-% solution treatments may be caused by the following: (*a*) favourable conditions caused by the decomposition of wood constituents by $CuSO_4 \cdot 10CuO$; (*b*) absorption of the Cu component by lignin liberated by the fungus, followed by reaction with oxalic acid also liberated by the fungus to give a substance temporarily named by the author 'lignin-copper-oxalic acid' (l.c.o.a.) which is scarcely decomposed by cold N-H_2SO_4 solution; and (*c*) the combined action of fungal decay and 'l.c.o.a.' in destroying wood. This theory is confirmed by the steady increase of cellulose consumption, especially during the later stage of the 300-day test, by the accumulation of the lignin component and by the increase of 'l.c.o.a.' in the residue at the end of 300 days. (III) In tests with Cu arsenite and Cu arsenate: (1) Growth of *P. vaporaria* was inhibited at 0·2% with the arsenate and at 0·1% with the arsenite and also with Na arsenite, using the Petri-dish method. (2) The decaying action of the fungus was inhibited at 1·0% Cu arsenate and 0·5% Cu arsenite ammoniacal solutions in the test-block method. *From author's summary.*

3886. HARMSEN, L. *Merulius tignicola* Harmsen, eine neue Hausschwamm-Art in Dänemark. [***M. tignicola*, a new dry-rot species in Denmark.**] *Holz Roh- u. Werkstoff* 11 (2), 1953 (68–9). [G.g.] P.R.

Describes a new *Merulius* species which differs in some important features from the known species.

3887. [**Pipe rot in swamp-grown *Shorea albida*.**] *Rep. For. Dep., Sarawak 1951*, 1953 (13).

The incidence of pipe rot in swamp-grown *S. albida* was studied in an almost pure stand and at a sawmill working in this forest. The trees are nearly always hollow, but the majority of the pipes are clean, i.e. the wood round the pipe is sound; in up to 10% of the logs, however, there is a zone of incipient rot, 2–3 in. wide, immediately adjoining the pipe. Measurement of a large number of logs showed that the width of the sound wood in inches is, on the average, equal to the girth of the log in feet. The average volume of the pipes in a sample of 240 logs was just under 25% of the total volume of the logs, but this refers only to logs considered worth extraction from the forest.

3888. KRSTIĆ, M. Rezultati jednokratnog premazivanja bukovih trupaca i železničkih pragova fluralsilom. [**The results of a single painting of Beech logs and sleepers with Fluralsil.**] *Rad. Inst. nauč. Istraž. šum., Beograd* No. 1, 1950 (142–86). 6 refs. [Serb.f.]

The following results were obtained: (1) A single application to barked surfaces did not prevent

fungus attack. In tests *in vitro*, however, Fluralsil had a drastic effect on *Coriolus versicolor*. Decay was noticeably more rapid in the interior of the logs than in the sleepers, for both treated and untreated material. (2) Winter-felled sleepers, the transverse surfaces of which were treated with solution of Fluralsil in oil, showed less decay after 7 months than material completely treated. Sleepers similarly treated with a 5% aqueous solution of Fluralsil were also only in the first stage of decay. After one year, incipient decay reached to a depth of 45 cm. Controls gave equally good results. (3) In summer-felled sleepers the oil solutions gave better results than the aqueous solution, and treated material than controls. The controls gave poorer results than winter-felled material. (4) Winter-felled logs treated with oil solutions or the 5% aqueous solution were attacked after 7 months to a depth of 30 cm. Controls were in slightly better condition. After one year, decay in its second phase had penetrated to a depth of 80–90 cm. from each end of the logs, and carpophores of *Schizophyllum vulgare* and *Stereum purpureum* were present on treated and untreated logs. (5) Summer-felled logs were decayed to a depth of 60 cm. after 5 months. Fruiting bodies of *Bispora monilioides* were frequently present. After one year most of the treated and untreated logs showed attack throughout the wood, and the majority bore sporophores of *Schizophyllum vulgare* and *Stereum purpureum*. In the author's view, the prevention of rapid surface drying in order to minimize the development of checks which give entry to the fungi, is the most important problem in the preservation of Beech timber by surface treatments.

845. *Attack by Animals*

845.1. Marine Borers

See also No. 3860.

3889. Bourdillon, A. Influence de la température lors de la fixation de *Limnoria lignorum* Rathke sur le bois. [**The influence of temperature in causing *L. lignorum* to attach itself to wood.**] *C.R. Acad. Sci., Paris* 236 (1), 1953 (139–41). [F.] O.R.S.

On the basis of laboratory experiments, gives values for F (= the probability that any one *Limnoria* will attach itself to a piece of wood with which it comes in contact) at different temperatures. F values increase with increasing temperature between 15 and 25° C., but the relationship is not linear. Further experiments on the effect of light and the chemistry of the wood on F are planned.

3890. **Use arsenic to fight teredo worm.** *Paper Tr. J.* 135 (19), 1952 (18). P.R.

Announces an As preparation which, sprayed in the form of a 1/50,000 aqueous solution over large Davis rafts, is said to protect the logs against teredo attack. It has been developed by C. Fulton and P. C. Trussel of the B.C. Research Council.

3891. Fulton, C. O. **Prevention of shipworm attack on sawlogs transported in rafts.** *J. For. Prod. Res. Soc.* 3 (1), 1953 (69, 81–2). P.R.

An account, with discussion, of laboratory tests of 40 chemicals against *Bankia setacea*. Na arsenite in a concentration of 1/40,000 parts sea-water, and dinitro-*o*-cyclohexyphenol (1/200,000) were the only compounds that appeared commercially possible. [Cf. *For. Abstr.* 14 (p. 241).]

845.2. Terrestrial Borers

See also Nos. 3554–5.

3892. Schuch, K. Eine Klimatisierungseinrichtung für das Studium ökologischer Fragen bei Holzschädlingen. [**Air conditioning equipment for studying ecological questions relating to wood-destroying insects.**] *Z. PflKrankh.* 59 (9/10), 1952 (353–8). 3 refs. [G.g.e.] I.I.E.

Aquarium tanks used as breeding chambers are supplied with air streams of fixed moisture content by electrically controlled ventilators of the type used for aquaria. The m.c. of the air stream is regulated by the presence of a saturated solution of one of a number of salts.

3893. Vité, J. P. Die holzzerstörenden Insekten Mitteleuropas. [**The wood-destroying insects of central Europe.**] 'Musterschmidt', Wissenschaftlicher Verlag, Göttingen. 1952. pp. 157 + 78 + 10 plates. Numerous refs. [G.] Price £1. 2*s*. each part.

The work is in two parts, one consisting of the text with some illustrations, and the other of illustrations only. The text contains a general introduction dealing with the biology, ecology and economic importance of such insects in general and this is followed by notes on the life history, distribution and economic importance of individual species.

3894. Jacquiot, C. Insectes attaquant les résineux abattus. [**Insect pests of felled softwoods.**] *Étude tech. Inst. nat. Bois* No. 12, 1952. pp. 5. [F.]

Describes several insect pests and measures to prevent their development (felling season, barking, and chemical control) in France.

3895. Joly, R. Dégâts en profondeur dans les grumes. [**Deep damage in logs.**] *Rev. Bois Appl.* 8 (4), 1953 (3–7). 1 ref. [F.]

An illustrated description of the life habits of *Platypus cylindrus*, *P. oxyurus*, *Bostrychus capucinus*, *Xylonites praeustus*, *Hylecoetus dermestoides*, and *Lymexylon navale*.

3896. Harris, E. C. **Vermin in buildings and their extermination. Part II. Insects injurious to woodwork in buildings.** *Journal of the Royal Institute of British Architects, London* 60 (5), 1953 (193–5). P.R.

Discusses the recognition of damage and the principal types of insect attack in new wood (pinhole-borer [ambrosia?] beetles, *Lyctus*, *Hylotrupes bajulus*, and *Ernobius mollis*) and in old (*Anobium punctatum*, *Xestobium rufovillosum*, and wood-boring weevils), and gives general information on eradication and prevention of these insect pests.

3897. Vogt, G. B. **Report on an investigation of the ambrosia beetle problem of Kanyin [Dipterocarp] timber for the Forestry Department of the Government of Burma.** *Burmese For.* 2 (2), 1952 (89–94).

Preliminary investigations at several sawmills showed that: (1) damage was comparatively slight

in rafted logs; (2) degree of infestation varied between non-rafted logs from different localities, being least in logs from recently opened-up areas; (3) re-infestation is possible in converted timber in mill storage yards or even on shipboard. Recommendations are made on lines of research that need following up.

3898. RICHARDS, M. **Forest insects and wood-destroying insects of New South Wales. Part VII. Insects attacking the felled log or green timber. The ambrosia beetles (pin-hole borers).** *Tech. Notes For. Comm. (Div. Wood Technol.) N.S.W.* 6 (1/2), 1953 (6–9). 3 refs.

3899. BLAIS, J. R. **Borer control in Balsam Fir, Spruce, and Jack Pine logs.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 9 (2), 1953 (2–3).

An earlier experiment [cf. *For. Abstr.* 13 (No. 4351) indicated that water-wettable DDT was almost as effective as an oil solution of DDT in protecting logs from borer attack in the forest. Further experiments in 1952 gave much heavier mortality of eggs and small larvae on logs treated with oil solution. The difference in these two experiments is probably due to the much heavier rainfall during the oviposition period in 1952 (10·9 in. compared with 3·6 in.).

3900. HETRICK, L. A., and MOSES, P. J. **Value of insecticides for protection of Pine pulpwood.** *J. econ. Ent.* 46 (1), 1953 (160–1).

A number of insecticides were tested on freshly cut and stacked Pine pulpwood in the form of a 0·5% spray. Four weeks after treatment the wood was examined for insect attack, and an evaluation of the insecticides was made. All provided some protection. BHC gave excellent results. Chlordane and toxaphene killed some of the attacking insects but failed to prevent infestation. Aldrin, dieldrin, endrin, heptachlor and isodrin were of intermediate value.

3901. **[Preservative treatment of plywood.]** *For. Res. India 1948/49, Part 1* 1952 (48).

Plywood panels of *Bombax malabaricum* and *Terminalia belerica* were treated by spraying with 2% and 4% DDT and Gammexane L.G. 140, and were stored for a year in ordinary warehouse conditions together with untreated controls. Spraying was done with an ordinary Flit pump after bundling. At the end of a year, the treated bundles were completely free from attack, whereas controls were moderately attacked by *Lyctus africanus* and *Heterobostrychus aequalis*.

3902. CHATTERJEE, P. N. **Protection of plywood in storage in godowns against *Lyctus* beetles by treatment with dichloro-trichloro-ethane (D.D.T.) and benzene hexachloride (B.H.C.).** *Indian For.* 79 (5), 1953 (304–6). 2 refs.

Bundles of plywood panels made from *Bombax malabaricum* and *Terminalia belerica*, and sprayed on their exposed edges with 2–4% DDT or 0·2–0·4% BHC in kerosene oil were completely protected against *Lyctus* and *Heterobostrychus aequalis* for 3–10 months.

3903. BERCK, B., and SMALLMAN, B. N. **Absorption and efflorescence of DDT deposited on wood.** *Soap* 28 (4), 1952 (131–3). 7 refs. P.R.

Plywood panels were treated with ca. 0·125 g./sq. ft. of DDT (in oil solution, as water-wettable powder suspension, and as aqueous emulsion), after which they were stripped with C_6H_6, one or 45 days after treatment. It was found that, after 1 day, the following % of DDT were absorbed by the wood, and so lost to insect control: 47·8, 40·9, and 33·0% for the solution, suspension, and emulsion, respectively. After 45 days, the figures were: 22·8, 37·6, and 19·4%. The increase observed for the solution and emulsion is attributed to the efflorescence of DDT from a supersaturated solution within the wood.

845.3. Termites

3904. WEIDNER, H. Weitere Mitteilungen über das Auftreten der Termite *Reticulitermes flavipes* (Kollar) in Hamburg. **[Further report on the *R. flavipes* outbreak in Hamburg.]** *Zeitschrift für hygienische Zoologie und Schädlingsbekämpfung, Berlin* 39 (8/9), 1951 (259–65). 5 refs. [G.] I.I.E.

Termites, reported in Hamburg in 1937, have survived until 1951, often in houses poorly heated during the hard winters following the war, and have spread. They are reported from structural woodwork and in one case in a growing tree.

3905. WOLCOTT, G. N. **Stilbene and comparable materials for dry-wood termite control.** *J. econ. Ent.* 46 (2), 1953 (374–5). 5 refs.

Presents a table showing the results of tests of various materials in the control of *Cryptotermes brevis*. The substances reported on are identical with or similar to the constituents responsible for the natural resistance of some woods to termite attack.

3906. **[Preservative treatment against termite attack.]** *For. Res. India 1948/49, Part* 1 1952 (49).

In Sept. 1948 freshly felled billets of *Albizzia procera* and *Dalbergia sissoo* and seasoned pieces of *Bombax malabaricum* and *Pinus longifolia* were treated with a kerosene-oil solution of paraffin wax at pressures of 75 and 50 lb. for 20 and 15 minutes respectively, and placed vertically in the graveyards exposed to termite attack, together with untreated controls. At the end of April 1949 all the treated pieces were free from termite attack, the controls of *A. procera* and *B. malabaricum* were moderately to heavily attacked, and the controls of *P. longifolia* and *D. sissoo* had not been touched by termites.

846. *Steaming*

3907. KISSER, J., and STEININGER, A. Die mikroskopische Unterscheidung von gedämpftem und nicht gedämpftem Buchenholz. **[Distinguishing steamed from unsteamed Beech wood microscopically.]** *Repr.* from *Mikroskopie, Wien* 7 (9/10), 1952 (363–4). 1 ref. [G.g.e.] X.

The distinction can be easily and quickly made by microscopic examination, since the starch in the wood parenchyma and medullary rays is swollen in the steamed wood and intact in the unsteamed.

847. *Drying (Seasoning)*

See also Nos. 3412, 3448, 3670, 3709, 3812, 3818, 3829.

3908. PECK, R. E., GRIFFITH, R. T., and NAGARAJA RAO, K. **Relative magnitudes of surface**

and internal resistance in drying. *Industr. Engng. Chem.* 44 (3), 1952 (664–9). 15 refs. P.R.

Derives the equation $d\bar{C}/d\theta = -M\bar{C}^n$, and its integrated form

$$\left(\frac{\bar{C}}{\bar{C}_o}\right)^{(1-n)} - 1 = -\frac{(1-n)M\theta}{\bar{C}_o{}^{(1-n)}}$$

where $\bar{C}$ is the free moisture concentration; $\bar{C}_o$, the initial free moisture concentration; M and n, constants; and θ, time. Results obtained with rectangular slabs of Balsa wood 0·2–0·85 in. thick give for the plot of drying rate against average concentration a straight line on double-log paper in the ranges of moisture concentration, humidity, air velocity and thickness studied, thus agreeing with the theoretically derived equation. The plot of $1/\sqrt{M}$ versus $1/V^{0·8}$ is a straight line which, when extrapolated to the zero value of the latter quantity gives an intercept proportional to the resistance in the solid phase.

3909. MATHEWSON, J. S. **Air seasoning of Lodgepole Pine poles.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1922, 1952. pp. 12 + 5 photos + 8 gphs. + 8 tables. P.R.

Presents tabulated and graphed results of tests made for the purposes of studying the practical possibility of using resistance-type moisture meters for Lodgepole Pine poles before preservative treatment, determining the effect of different stacking methods, and determining the circumferential shrinkage of poles during air seasoning. The moisture meter was inherently less accurate at m.c. values above than at those below the fibre-saturation point. The final average and standard deviation of the meter readings taken on poles in the modified cross-hatch stack were lower than those of poles in the usual cross-hatch stack, whether roofed or not. During air seasoning to 20% the average circumferential shrinkage of sample poles at the ground line was ca. 1·3% of the circumference when green. A method is described permitting estimation of the drying-rate factor for class 7, 30-ft. poles under a given set of conditions.

3910. EMELJJANČIKOV, A. N. Vozdušnaja suška pilomaterialov v uslovijah Krasnojarska. [**Air seasoning of sawn timber in the [climatic] conditions of Krasnoyarsk.**] *Lesn. Prom.* 12 (7), 1952 (26–7). 1 ref. [Russ.]

Presents graphed results of observations on the air-seasoning of Pine and Larch boards and planks in the yard of the Krasnoyarsk woodworking combine. The roads between the stacks were 8 m. wide; each section contained 4–12 stacks, each 4 m. high and ca. 8 m. side, with 2-m. spacing and standing on foundations. The stacks were self-stickered, with the air-spaces systematically varied in width, i.e. for boards below 4·5 cm. thick the space near the outside of the stack was equal to $\frac{1}{2}$ the board width, and for thicker boards $\frac{1}{5}$ of the board width, while towards the mid-line the spaces were roughly 3 times as wide. The favourable air-seasoning period was found to be from 1 April to 1 Sept. with the maximum seasoning rate in June–July, and minimum in Oct.–March. The seasoning rate for Larch was found to be roughly $\frac{1}{2}$ of that for Pine. The equilibrium m.c. was 11·8–11·5% in June–July and 16·5–16·0 in Jan.–Feb. It is concluded that, in the Krasnoyarsk climatic conditions, converted Pine can be seasoned from 58–60% m.c. down to shipping-dry condition not only in summer but also in spring and part of autumn.

3911. KOLLMANN, F. **Development of wood seasoning.** *Transl. For. Prod. Lab., Can.* No. 3, 1952. pp. 18. 57 refs. Transl. from *Medd. svenska TräforsknInst.* (*Trätekn. Avd.*) No. 13*B*, 1951. Limited distribution. [See *For. Abstr.* 13 (No. 2576).]

3912. LADELL, J. L. **High-temperature kiln-drying of Canadian woods: report of exploratory investigations—softwoods.** *Mimeo. For. Prod. Lab., Can.* No. *O*–170, 1953. pp. 11 + 2 photos + 1 gph. 5 refs.

Seasoning tests at temperatures over 212° F. were made on boards of Eastern White Spruce, Eastern White Pine, Western Hemlock, Douglas Fir and Western Red Cedar. Drying was 3–6 times faster than that in conventional methods. Seasoning defects were negligible, apart from case-hardening which was uniformly severe, but conditioning treatment after the cooling period gave fairly satisfactory results. Moisture-content variation, even after conditioning which significantly increased uniformity of m.c. was, however, outside acceptable limits. In bending strength tests, Western Red Cedar and White Pine showed a 5% and Douglas Fir a 10% reduction in strength.

3913. ELMENDORF, A. **Method of drying hardwood.** *U.S. Patent* No. 2,556,686, June 12, 1951. pp. 4. P.O.

To prevent hydrolysis during the drying of thin boards of hardwood from the green state, they are dried without any constraint until the free moisture is removed from their interior while the outside is somewhat below the fibre-saturation point, after which they are dried under constraint to prevent shrinkage while under heat and pressure.

3914. **Auxiliary kiln equipment.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1900–3, 1952. pp. 12+23 photos + 6 dgms. P.R.

An illustrated description of different apparatus and instruments for determining moisture content, temperature, and air movement in kilns, and of equipment for stacking and unstacking lumber.

3915. KIMBALL, K. E., and TORGESON, O. W. **A small lumber-drying unit employing a portable crop drier for heat and air circulation.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1799, 1952. pp. 11 + 2 photos + 1 dgm. + 3 gphs. + 4 tbls. P.R.

Describes a special low-cost lumber-drying unit designed at Madison, with tabulated and graphed results of tests. It has a system of reversing and recirculating the air, the source of heat and air circulation being the portable crop-drier owned by many farmers and used only during harvesting. Partially air-dried (27% moisture content) mixed charges of soft Maples, Ash, and Elm were dried to 9% in 4 days; green Aspen was dried to 7% in 17 days, and green Basswood in 14 days. The dried

material was acceptable for millwork and other interior uses. Estimated costs are given.

3916. Wirtschaftlicher Holztrockner für Kleinbetriebe. **[Economic wood-drier for the small user.]** *Holz Roh- u. Werkstoff* 11 (4), 1953 (166–7). [G.] P.R.

An illustrated description of the 'Hildebrand-Kleintrockner HD74', embodying a seasoning chamber 80 cm. wide, 100 cm. high, and 250 cm. long, of about 1 cu.m. capacity. The chamber, which is generally made by the user himself from fibreboards or wooden boards, is treated with a special substance to withstand humidity etc. Heating is by steam or electricity, the latter calling for two heaters of 3 KW. each. The 1·5-KW. motor, fan, ventilating ducts, and air inlet and exit are arranged in a self-contained unit. It is claimed that, depending on the moisture content of the wood, the drier requires only 800–1200 kcal./kg. evaporated water. Graphs showing seasoning curves obtained in tests are presented.

3917. Ogura, T., Terazawa, S., and Tutumoto, T. **[Experiments using a seasoning kiln of the internal fan type.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 60, 1953 (49–64). 4 refs. [Jap.e.]

In tests in an interior-fan kiln (described and illustrated) green boards of Asada [*Ostrya japonica*] and Nara [*Quercus crispula* or *Q. serrata*] were piled by different methods and dried. Figures showing the progress of drying and final moisture content of boards in different positions, and the velocity of air passing through the interspaces, are given in graphs and tables, with figures for the progress and final m.c. of Asada boards air-dried for 2–3 months. Boards piled edge to edge dried as well as those spaced at some distance; more boards could therefore be dried in a charge using this method. Further experiments are needed on the air velocities necessary to dry boards evenly and in the minimum time, and on optimum drying schedules. A vent in the upper as well as the lower part of the chimney and the use of non-rusting metal parts for the inside of the kiln are recommended. *From authors' summary.*

3918. Fessel, F. Hartholztrocknung in der Zentrifuge. **[Drying of hardwoods in a centrifuge.]** *Holz Roh- u. Werkstoff* 10 (10), 1952 (391–4). 16 refs. [G.g.] P.R.

Illustrated description of a hydroextractor with spiral air circulation on the Eisenmann system (Germany). The centrifuge has room for 3 stacks, totalling 7 cu.m. The air velocity in the radial direction averages 3 m./sec., that at the periphery, 5 m./sec., while the air is circulated ca. 1500 times/hour in the radial-vertical circuit. The maximum air velocity is in the layer nearest to the wood which accounts for the greater speed of seasoning (for Beech and Oak the time required is ½ that required in kiln seasoning). Seasoning is more uniform, e.g. the difference in moisture content between the ends of the boards (nearest to and farthest from the axis) is only ± 1·5%. Temperatures up to 120° C. can be used. The energy expenditure for ventilation is ca. 1500 watts /cu.m. in kilns, and only 150 watts/cu.m. in the centrifugal plant.

3919. Trégis, L.-A.-J. Procédé de séchage du bois. **[Method of wood drying.]** *French Patent* No. 1,001,957, Feb. 29, 1952. pp. 2. [F.] P.O.

Wood is first immersed in a salt solution (e.g. an acidulated aqueous solution of NaCl, Na_2SO_4, $CaCl_2$, plus a wetting agent) for 12–96 hours so that it acquires a moisture content of 75–80%, the degree of humidification and the subsequent seasoning (e.g. in kilns where the initial conditions are 30° C. and 60–65% relative humidity, and the final conditions 60° and 35% r.h.) being such that, during the whole process of seasoning, the moisture content increases from the interior outwards.

3920. Loughborough, W. K., McMillen, J. M., and Espenas, L. D. **Process for drying wood.** *U.S. Patent* No. 2,546,162, March 27, 1951. pp. 12. P.O.

A hygroscopic aqueous paste that minimizes the drying and shrinking of the exterior of wood before the interior dries, is applied to the surface only, remaining there in a water-swollen gel condition as long as the wood has an average moisture content of 30% or higher, after which the wood is open-piled and immediately kiln-dried to at least 25% m.c., without removing the coat. The paste used is a mixture of a hydrophilic thickening agent and an unpolymerized resin-forming material, its vapour pressure being 65–90% of that of water.

848. *Timberyard Practice. Handling and Storage of Timber*

See also No. 3855.

3921. Scheffer, T. C., and Zabel, R. A. **Storage of Beech logs and bolts in the Northeast.** *Beech Utiliz. Ser. Ntheast. For. Exp. Sta.* No. 2, 1951. pp. 13. 5 refs.

Discusses the control of decay in *F. grandifolia* logs by storage during the summer in water or, less effectively, under wet hay, and the limitations of chemical control. Lists end-coatings to prevent end-checking. Protection against insects and blue-stain is rarely needed in the N.E. of the U.S.A.

3922. Meriluoto, J. Sahatavaran auto- ja rautatiekuljetus. **[Road and rail transport.]** *Pap. ja Puu* 35 (4*a*), 1953 (177–80). [Fi.e.] P.R.

Makes recommendations for handling timber when it has to be carried by lorry and then transferred to railway wagons.

85. GRADING OF WOOD AND WOOD PRODUCTS

851. *Timber Quality in General*

See also No. 3338.

3923. Scott, M. H. **The quality of the wood of young trees of *Pinus caribaea* grown in South Africa.** *J.S. Afr. For. Ass.* No. 22, 1952 (38–47 + 9 photos + 1 gph.).

Data are given from tests of wood from several sites. They indicate that wood from S.-African-grown *P. caribaea* is very similar in its early stages (up to ca. 24 years) to that of *P. patula* and can be used for the same purposes, but that it rapidly becomes much heavier, harder, more resinous, and more difficult to work by hand. The older wood should therefore find its main use as structural

timber. As practically no heartwood is formed in the first 25–30 years, the wood is non-durable and stains readily. Though compression wood was more obvious in this species than in other Pines so far investigated in S. Africa, its effect was seriously felt only in scantlings of 2 × 2 in. and 2 × 3 in. The wood of *P. hondurensis* produced a milder type of timber, much easier to work by hand, whiter, and with much smaller knots. Both species contained a large number of resin streaks and pockets. *From author's summary.*

852. *Detection, Recognition and Assessment of Injuries and Defects*

See also No. 3699.

3924. **Sloping grain in timber.** *Trade Circ. For. Prod. Aust.* No. 48, 1952. pp. 17.

A popular illustrated account of abnormal grain direction, its effect on strength properties, and the slope permissible for various uses.

3925. Webb, L. J. **An occurrence of aluminium succinate in *Cardwellia sublimis* F. Muell.** *Nature, Lond.* 171 (4354), 1953 (656). 3 refs.

Describes a massive deposit found in a cavity ('wind shake') in the heartwood of a log from Jarrah Creek, near Tully, N. Queensland. The log was ca. 10 ft. in girth and the deposit apparently extended from the base to at least 25 ft. up the stem. Qualitative analysis revealed no metal but Al, and no organic acids other than succinic. Figures are also given for the Al and ash contents of another log of this species from Tully.

853. *Grading of Logs*

See also No. 3932.

3926. Parks, W. H. **Second growth Douglas Fir quality classes.** *Timberman* 54 (6), 1953 (76 . . . 80).

In a study of 467 logs the following results, illustrated by graphs and tables, were obtained: (1) Logs with one or more clear quarters produce higher quality lumber than those with no clear quarter. (2) The quality of the lumber varies inversely with the size of the largest knots. (3) Rate of growth (measured by the % of log diameter having less than 6 rings/inch) is most important in logs of the 1-in. knot-size class, less so in those in the 2-in. class and unimportant in the 3- to 7-in. knot-size classes. (4) The effect of diameter on the quality of lumber recovery is unpredictable but relatively unimportant for the 8- to 27-in. logs included in the study. (5) Quality of lumber recovered is not greatly affected by the number of knots. The following quality classes for logs, based on number of clear quarters, maximum knot size and rate of growth are suggested: Class A — logs containing one or more clear quarters, and logs having 1-in. knots but not more than 50% of the log diameter in medium plus coarse grain; Class B — logs in the 2- and 3-in. knot-size classes, and logs having 1-in. knots and more than 50% medium plus coarse grain; and Class C — logs in the 4- to 7-in. knot-size classes. For standing timber the corresponding classes are: A — logs with one or more clear quarters and logs in the 1-in. knot-size class; B — logs in the 2- and 3-in. knot-size classes; and C — logs in the 4- to 7-in. knot-size classes. Average lumber-grade recovery using classes with and without the growth-rate factor is shown in tables. [Cf. *For. Abstr.* 13 (No. 2583).]

854. *Grading of Converted Timber*

3927. **Rules for the measurement and inspection of hardwood lumber, Cypress, veneers, and thin lumber.** National Hardwood Lumber Association, Chicago. Revised, 1953. pp. 104.

Cf. *For. Abstr.* 12 (No. 630).

3928. Novas especificações para classificação do pinho serrado. [**New specifications for the classification of sawn Parana Pine.**] *An. bras. Econ. flor., Inst. nac. Pinho* 4 (4), 1951 (270–9). [Port.e.]

The text of a new standard for *Araucaria angustifolia*, which came into force on 21st December, 1951.

3929. **Grading and sizing of softwood flooring.** *Brit. Stand.* No. 1297, 1952. pp. 8. P.R.

3930. Kotimaisen rakennesahatavaran lujuusluokitteluohjeet. [**Strength grading rules for structural sawn timber.**] *Tied. Valt. Tekn. Tutkimusl.* No. 93, 1952. pp. 35 + 1 tbl. + 20 photos + 7 dgms. [Fi.] I.F.B.

Includes sections on: recommendations for the use of grading rules, definitions of properties and defects of sawn timber and methods of measurement; permissible defects and properties of the different strength grades; making of strength-graded structural sawn timber; Swedish, German and English equivalents of terms used in the grading rules; grading rules for structural sawn timber, grade T-100, made in collaboration with Swedish timbermen; and a proposal for the moduli of elasticity and permissible stresses to be used in the standard specification for timber structures. There is a series of photographs and diagrams and a table with legends in Finnish, Swedish, German, and English showing the various defects, strength marks, and sp. gr., summerwood % and width of growth rings, for typical samples of Finnish Pine.

3931. Cooper, K. L. **Preferred stress grades for structural timber.** *Aust. J. appl. Sci.* 4 (1), 1953 (77–83). 10 refs. P.R.

Considers the establishment of universal stress grades for timber, and suggests corresponding series in metric and British units. The properties of the preferred series are examined and their application to different uses discussed. *From author's summary.*

86. PULP INDUSTRIES. CHEMICAL UTILIZATION OF WOOD

See also Nos. 3735 *et seq.*

861. *Paper and Cardboard Industry (Pulp, Paper, Cardboard, Fibreboards)*

See also Nos. 3841, 3880.

3932. McGuire, J. R. **What will the pulp mills buy.** *Pulp Paper Mag. Can.* 54 (3), 1953 (284 . . . 288).

Discusses species, size and quality requirements commonly accepted in mills of E. Canada and the

northeastern parts of the U.S.A., and accepted standards for preparing pulpwood bolts.

3933. CRANDALL, H. C. **Wood storage problems in the pulp and paper industry.** *J. For. Prod. Res. Soc.* 3 (1), 1953 (72–3). 2 refs. P.R.

Gives figures showing decrease with wood storage in pulp yields and strength, and increase in the amount of wood to give one ton of pulp.

3934. JENSEN, W., and JORRI, H. Björk som råmaterial för massaframställning. V. Styrkeegenskaperna hos blandningar av björk- och gransulfitmassor. [**Birch as raw material for pulp. V. Strength properties in Birch and Spruce sulphite pulp mixtures.**] *Pap. ja Puu* 35 (2), 1953 (35–7). 4 refs. [Sw.e.] P.R.

Cf. *For. Abstr.* 13 (No. 4376).

3935. BHAT, R. V., and VIRMANI, K. C. **Indigenous cellulosic raw materials for the production of pulp, paper and board. Part XIV. Chemical pulps and writing and printing papers from *Sterculia campanulata*, Wall.** *Indian For.* 79 (3), 1953 (169–75 + 2 specimen sheets). 2 refs.

Laboratory experiments on the sulphate digestion of the wood of *S. campanulata* are described. The bleached chemical pulps were characterized by high strength properties. The average fibre length was 1·49 mm. The results of pilot-plant experiments on the production of chemical pulps and writing and printing papers are included. The investigation indicates that this wood is a suitable raw material for the production of writing and printing papers. A sample of writing paper made entirely from *S. campanulata* pulp and another of printing paper made from a mixture of 68% *S. campanulata* pulp and 32% Bamboo pulp are appended. *From authors' summary.*

Pulping and Pulp

See also Nos. 3716, 3769, 3952.

3936. **Tappi Standards. Acid-insoluble lignin in wood pulp. Corrected Tappi Tentative Standard T 222 m-50.** *Tappi* 35 (12), 1952 (128*A*–129*A*). 2 refs. P.R.

3937. IRVINE, J. E., and HENDERSON, E. W. **Wood chipper and chipper motor selection.** *Pulp Paper Mag. Can.* 54 (3), 1953 (246–52). 2 refs.

Demonstrates a method of selecting the proper chipper in relation to average and maximum wood diameter, required capacity, and required chip length, and discusses the use of different types of motor. *From authors' summary.*

3938. EBERHARDT, L. **Removal of bark from chips and wood pulp.** *Paper Tr. J.* 135 (25), 1952 (23–4, 26, 28, 30). P.R.

An illustrated description of (1) the shaker-aspiration method for the removal of bark from chipped wood, and (2) the Centri Cleaner for the removal of bark and other impurities from pulp. The former is recommended for partial removal of bark, as in the manufacture of insulation boards, hardboards, saturating felts, and some container boards; the latter is best used to remove traces of dirt after pulping. Bark separation in (1) is accomplished on a double-deck shaker screen equipped with an air-aspiration hood; the finer material is predominantly bark, while coarser material is returned to the bark 'drubber' for further treatment. The Centri Cleaner is a long cone into which the material to be cleaned is pumped through a tangential inlet in the larger part; a vortex action in the cone ensures a separation according to sp. gr. and specific surface.

3939. WIKMANSHYTTE BRUKS A.-B. Sätt att förbehandla ved för kokning av massa. [**Method of pretreating wood before pulping.**] *Swedish Patent* No. 134,690, Feb. 26, 1952. pp. 2. [Sw.] P.O.

Wood, before or after barking, is treated with steam at 80–100° C. for at least 10 hours, cooled by adding water, chipped and then subjected to sulphite digestion.

3940. WIKMANSHYTTE BRUKS A.-B. Sätt att förbehandla flis vid kokning av massa. [**Method of pretreating chips for pulping.**] *Swedish Patent* No. 134,691, Feb. 26, 1952. pp. 2. [Sw.] P.O.

Wood chips are treated with steam at 80–100° C., for at least 3 hours, cooled by adding water, and then subjected to sulphite digestion.

3941. HATA, K., and SOGO, M. [**Studies on the pulp of 'Akamatsu' (*Pinus densiflora*) wood. XV. Difficulties in sulphite pulping of the heartwood (4).**] *J. Jap. For. Soc.* 34 (3), 1952 (74–7). 3 refs. [Jap.e.]

[Cf. *For. Abstr.* 14 (Nos. 825–6).] Shows the relation between the % of combined SO_2 in the pulping liquor and the difference in pulping reaction velocity between heartwood and sapwood and presents formulae for the reaction velocity of delignification and the relation between rate of removal of lignin and cooking time.

3942. KLAUDITZ, W., and BECKER, M. Verdaulichkeit von Buchenholz-Holocellulose durch Wiederkäuer. [**Digestibility of Beechwood holocellulose by ruminants.**] *Holzforschung, Berlin* 6 (4), 1952 (103–4). 4 refs. [G.g.e.] P.R.

A digestibility value of 80–90% was found when holocellulose (with 5·4% residual lignin) obtained by treating Beechwood chips with acidified $NaClO_2$ was fed to two merino rams.

3943. GABRIELSON, C. O. Träkemisk industri i Sverige. [**Wood chemical industry in Sweden.**] *Pap. ja Puu* 35 (3), 1953 (73–8). 3 refs. [Sw.e.] P.R.

Describes the development and present extent of manufacture of organic chemicals from by-products of the pulp industry.

Paper

See No. 3719.

Fibreboards

See also No. 3818.

3944. SIDES, R. H., and COLUCCI, R., JR. **The European chipcore industry.** *J. For. Prod. Res. Soc.* 3 (1), 1953 (19–20, 78). P.R.

Describes in some detail German and Swedish processes of manufacturing chipboards for corestock, and compares them with those used in the U.S.A.

3945. KOLLMANN, F. Herstellung und Eigenschaften von Holzspanplatten der Norddeutschen Homogenholzgesellschaft m.b.H., Triangel. [**Manufacture and properties of chipboards made by the Norddeutsche Homogenholzgesellschaft m.b.H., Triangel.**] *Holz Roh- u. Werkstoff* 10 (12), 1952 (463–8). 1 ref. [G.g.] P.R.

An illustrated description of various production stages in the plant at Triangel, Germany, which was destroyed by fire in Oct. 1952. The plant used both hardwoods and softwoods, 4·0–5·5 cu.m. of wood being required for 1 ton of final product. The main products were of density 0·8 and thickness 8 mm., for flooring, and density 0·6, thickness 12–24 mm., for furniture.

3946. KLAUDITZ, W. Untersuchungen über die Eignung von verschiedenen Holzarten, insbesondere von Rotbuchenholz zur Herstellung von Holzspanplatten. [**Investigations on the suitability of different woods, in particular of *Fagus sylvatica* wood, for the manufacture of chipboards.**] *Bericht, Institut für Holzforschung, Braunschweig* No. 25/52 [1952]. pp. 50 + 7 photos. 12 refs. [G.g.] P.R.

Presents results of an investigation on: (1) the surface area of wood chips of different thickness and density; (2) bending strength of Spruce chipboards in relation to the thickness of individual chips; (3) relationship between the density of Beech chipboards and their bending strength; (4) bending strength of chipboards made from different woods in relation to chip thickness and chipboard density; (5) density of chipboards made from different woods but having the same bending strength; and (6) nail- and screw-holding power of Spruce and Beech chipboards. To calculate the comparative bending strengths of chipboards made from different woods, an auxiliary function is derived, viz. the 'efficiency %' (Wirkungsgrad %), equal to bending strength (kg./sq. cm.) × 2/basic density (g./c.c.) × 18, of the species used for the chipboard, where 18 is the static bending characteristic (bending strength/100 basic density, or 1/100th of the strength/density ratio). Chipboards of 200–250 kg./sq. cm. bending strength, made from thin 0·2-mm. flat chips, using 8 g. synthetic resin binder per 100 g. oven-dry weight of wood, have a density of 0·58 g./c.c. when made of Spruce, and 0·70 g./c.c. when made of Beech.

3947. ANDERSON, A. B., and RUNCKEL, W. J. **Douglas Fir branchwood in hardboard.** *Lumberm.* 80 (4), 1953 (134 . . . 139). 1 ref.

The material, branchwood 2 in. or more in diameter, from which twigs and needles had been removed, was treated by the following process covered by patent claims: chipping first in a laboratory chipper and then in a hammer mill containing a perforated plate screen with 1-in. holes; steaming for 5 mins. before defibration for 1 min. in an Asplund defibrator to which steam was admitted; pulping in a Bauer laboratory disc mill to the desired freeness; formation of the pulp into mats; pressing at room temperature and 500 lb./sq. in. for 2 min. to remove the water; a cycle of pressing at 375 or 410° F. for a short time, and release to allow trapped steam to escape; and a final increase in pressure, maintained until a satisfactory board was obtained. Six boards were made without and 6 with ½% resin size. Physical and mechanical properties of the boards compared satisfactorily with commercial boards and boards prepared by the same method from bark-free Douglas Fir wood. The water absorption of the branchwood boards was low [cf. *For Abstr.* 13 (No. 1709)] and the amount of size needed was 50% of that normally used, thus reducing costs. Less water is also needed, as branchwood pulp consistencies of 5–6% instead of the normal 1–2% proved satisfactory. Raw material is cheap and the manufacture of branchwood boards would provide a use for logging waste and reduce fire danger.

3948. BEHR, E., KUHN, E., and KEMPTER-BEHR, M. **Improved machine for producing long thin longitudinal fibred wood chips for wood chip boards and the like.** *Brit. Patent* No. 690,584, April 22, 1953. pp. 3 + 6 dgms. P.R.

The machine has a cup wheel, to the ring portion of which cutter knives are secured, protruding through the ring's inner periphery. A device is provided for pressing piece of wood, e.g. waste wood, against the cup wheel so that the knives cut off long, longitudinally-fibred wood chips.

3949. EL BANNA, A. I. **Improvements in or relating to the production of pressed or moulded wooden articles.** *Brit. Patent* No. 674,934, July 2, 1952. pp. 5. P.R.

A pressed or moulded wood product consisting of a mass of thin narrow individual strips of wood material coated with a binder consisting of a mixture of albumin and formaldehyde and piled on one another in random criss-cross fashion and united or consolidated under heat and pressure. The strips can be 0·5 to 5 mm. wide, cut along the grain from veneer 1–4 mm. thick, the temperature 100–120° C., and the pressure 10–15 kg./sq. mm.

3950. **Improvements in and relating to the manufacture of wall and like boarding.** *Brit. Patent* No. 684,350, Dec. 17, 1952. pp. 9 + 2 dgms. P.R.

A mat of sawdust or the like mixed with powdered thermo-setting resin is compacted in a compression zone between endless metal bands to reduce the mat to the required gauge and density, and then subjected to a holding pressure to prevent recovery of the mat during the curing of the resin, the compression pressure being 200–500, and the holding pressure ca. 50 lb./sq. in.

3951. Plaques à base de sciure de bois agglomérée. [**Bonded-sawdust boards.**] *French Patent* No. 970,091, Dec. 29, 1950. pp. 1 + 6 dgms. [F.] P.O.

Rigidity of the boards is achieved by inserting sheets of paper or other materials, dividing the sawdust into layers.

862. *Textiles and Cellulose Derivatives from Wood*

3952. SIMMONDS, F. A., KINGSBURY, R. M., MARTIN, J. S., and KELLER, E. L. **Purified hardwood pulps for chemical conversion. I. Aspen sulphite and prehydrolysis-sulphate pulps.** *Tappi* 36 (3), 1953 (103–10). 18 refs. P.R.

Tests were made on purified Aspen pulps made by the ammonia-base sulphite process, and by the prehydrolysis-sulphate process. Purification involved chlorination, alkaline extraction, and treatment with NaClO and ClO_2. The yield of sulphite pulp was 51%, of pulp purified by hot extraction 37·7%, and by cold 44·4%, the respective α-cellulose contents being 87, 94·4, and 96·3%. The prehydrolysis sulphate pulp was obtained in a yield of 42%, which fell to 38·2% after cold extraction and ClO_2 treatment, to 37·6% after hot extraction + NaClO, and to 37·7% after hot extraction + ClO_2; the respective α-cellulose contents were 92, 97·3, 94·7, and 95·5%. The experimental cellulose-acetate yarns made of purified sulphite and sulphate pulps were as strong as yarn made from a commercial softwood sulphite pulp of acetylation grade.

866. *Utilization of Wood Extractives*

3953. Anderson, A. B. **Pinitol from Sugar Pine stump wood.** *Industr. Engng. Chem.* 45 (3), 1953 (593–6). 17 refs. P.R.

Presents results of an investigation on the pinitol content in the heartwood of *Pinus lambertiana* stumps. The amount of pinitol in seasoned stumps (2 years after felling) varied within the following limits: top part of stump, 15·4–17·2; middle part, 5·2–7·7, and bottom, 3·2–4·5% (dry basis). In fresh stumps, the figures were: top, 10·8 ; middle 9·7, and bottom, 6·7. The yield for the whole stump (fresh or seasoned) averaged 166–196 lb. pinitol per ton of stump wood (dry basis).

3954. Murto, J. O. Mäntypuumme pihka voiteluöljyn raaka-aineena. **[Finnish Pine resin as raw material for lubricating oil.]** *Acta for. fenn.* 59 (2), 1952. pp. 297. 350 refs. [Fi.e.]

A detailed account of the wartime manufacture of lubricating oil from resin extracted from Pine stumpwood, with 18-page English summary.

867. *Destructive Distillation*

3955. Kishimoto, S., Naito, K. Tochizawa, K., Furuya, G., Kono, K., Unrinin, G., and Uchida, K. **[Studies on charcoal manufacture (first report). Experiments in charcoal manufacture at Shima.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 60, 1953 (1–48). [Jap.e.]

Charcoal was made from *Quercus serrata* in four types of kiln, illustrated by photographs and diagrams. Results showing yields and quality of charcoal are tabulated. *From authors' summary.*

3956. Kuriyama, A., and Sugiura, G. **[A portable charcoal kiln: the Black Rock Forest kiln.]** *J. Jap. For. Soc.* 34 (8), 1952 (262–4). 2 refs. [Jap.]

Suggests modifications in this kiln, in the light of the author's trials with it in Japan.

3957. Guérin, H., and Adam-Gironne, J. Sur la thioréactivité des combustibles solides. 1. Mise au point d'un essai et comparaison de combustibles de types différents et de charbon de bois de diverses essences. **[The thio-reactivity of solid fuels. 1. Establishment of the method and comparison of different types of fuel and of wood charcoal from different species.]** *Bull. Soc. chim. France* 20 (3), 1953 (302–3). 5 refs. [F.f.] O.R.S.

The thio-reactivity (reaction to S vapour, expressed as the % of S changed into CS_2) ranged from 56·2 for wood charcoal to 0·6 for graphite. That of charcoal from 9 hardwoods and 4 softwood species was comparatively constant, ranging only from 59·1 for Beech to 52·5 for Larch and 45·6 for Olive.

3958. Laviuzza, O. L. Destilación destructiva de las maderas de quebracho blanco, algarrobo, urunday y guayacan, con miras a la obtención de carbón para siderurgia. **[Dry distillation of wood of Quebracho Blanco, Algarrobo, Urunday and Guayacan, to obtain charcoal for steel manufacture.]** *Revista de la Facultad de Ciencias Químicas* (*Química y Farmacia*), *La Plata* 24, 1949 (1952), (107–9). 11 refs. [Span.] L.S.

The best charcoal for this purpose was obtained from Guayacan [*Caesalpinia melanocarpa*] at a temperature of 700° C.; the next best from Guayacan and Urunday [*Astronium balansae*] at 600°. The other charcoals obtained were unsuitable.

3959. Giaccaglia, A. U. Estudio del rendimento de líquido piroleñoso en la destilación pirogenada de algunas maderas argentinas a diversas temperaturas. **[A study of yields of pyroligneous acid from the dry distillation of some Argentine woods at various temperatures.]** *Revista de la Facultad de Ciencias Químicas* (*Química y Farmacia*), *La Plata* 24 1949 (1952), (79–85). 17 refs. [Span.] L.S.

The woods investigated were: Algarrobo [*Prosopis* sp.], Guayacan [*Caesalpinia melanocarpa*], Urunday [*Astronium balansae*] and Quebracho blanco [*Aspidosperma* sp.]. The results are presented in tables.

3960. Fidel, C. M. Estudio sobre la composición y poder calorífico de los gases incondensables provenientes de la destilación destructiva de cuatro maderas argentinas. **[Study of the composition and calorific value of uncondensable gases resulting from the dry distillation of four Argentine woods.]** *Revista de la Facultad de Ciencias Químicas* (*Química y Farmacia*), *La Plata* 24, 1949 (1952), (97–105). 20 refs. [Span.] L.S.

The results are presented of studies on Algarrobo [*Prosopis* sp.], Guayacań [*Caesalpinia melanocarpa*], Urunday [*Astronium balansae*] and Quebracho blanco [*Aspidosperma* sp.]. All the gases are suitable sources of power and heat.

3961. Pukkaman, S. **[Wood distillation pilot plant of the Kaset Sawmill No. 1.]** *Vanasarn* 10 (1), 1952 (46–9). [Siam.]

Brief account of its operation, technical and financial, under the Forest Department of Siam, with a table showing the yield for 13 hardwood species.

3962. Morgan, L. W., Armstrong, G. M., and Lewis, H. C. **Distillation of hardwood in a fluidized bed.** *Chemical Engineering Progress, Philadelphia* 49 (2), 1953 (98–101). 6 refs. L.S.

Powdered hardwood (Red Oak), when fluidized by a stream of N and distilled at 400° C. at atmospheric pressure, yielded after 30 min. of distillation the following products: charcoal 32, liquid products 29, tail gas 12, recovered gas 4% of the initial

weight, the loss thus amounting to 23%. The yield of CH_3COOH was 5·9%, that of CH_3OH 1·3%.

3963. Gillet, A., and Urlings, J. Pyrolyse du bois dans l'huile de palme. **[Pyrolysis of wood in palm oil.]** *Chim. et Industr.* 69 (2), 1953 (252–7). 3 refs. [F.f.] D.S.I.R.

Gives data on the behaviour of thin specimens (2 × 2 × 20 mm.) of wood (air-dry, or oven dried in N at 105° C.) when immersed in palm oil heated to temperatures between 250 and 330°. In oil at 290°, the specimens lost within less than 2 min. as much as 25% of their O content, without losing any C or H.

89. OTHER ('MINOR') FOREST PRODUCTS

See also section 28.

892. *Vegetable Products*

892.1. Grass. Litter. Leaf Fodder

3964. Kehar, N. D., and Negi, S. S. **Mangrove (*Avicennia officinalis* Linn.) leaves as cattle feed.** *Sci. & Cult.* 18 (8), 1953 (382–3). E.M.B.

Discusses the results of a study of their chemical composition, palatability and fodder value, and concludes that the leaves, which can be classed as fairly good roughage, can be fed to animals as up to 50% of the total roughage.

3965. Idnani, M. A., and Chibber, R. K. **Utilization of wild legumes for green manuring.** *Sci. & Cult.* 18 (8), 1953 (362–4). 5 refs. E.M.B.

Discusses African and American experiments in green manuring, and tabulates figures showing the chemical composition of leaves of 38 wild leguminous shrubs and trees growing near Delhi, the value of leaves of varying N contents in liberating assimilable N, and the effect of burying leaves at a rate of 50 lb. N/acre on growth and yields of wheat. It has been found that leaves can be dried in the sun without loss of manurial value.

892.4. Bark Products. Tanstuffs. Cork

See also Nos. 3139, 3670, 3737, 3761, 3793, 3841.

3966. Hergert, H. L., and Kurth, E. F. **The chemical nature of the extractives from White Fir [*Abies concolor*] bark.** *Tappi* 36 (3), 1953 (137–44). 14 refs. P.R.

3967. Bennett, E. C., and Pardee, A. M. **The chemical composition of Ponderosa Pine bark.** *Proceedings of the South Dakota Academy of Science, Vermillion* 29, 1950 (91–3). L.S.

3968. Kurth, E. F., and Chan, F. L. **Extraction of tannin and dihydroquercetin from Douglas Fir bark.** *Repr.* from *Journal of the American Leather Chemists' Association, Easton, Pa.* 48 (1), 1953 (20–32). 10 refs.

Discusses the extraction efficiency of various leaching arrangements and extraction periods. The most efficient extraction of total solids, tannin, and dihydroquercetin, was obtained when, before hot-water extraction, the bark was freed from wax by extraction with C_6H_6. Purity of tannin extracts varied with the bark condition before extraction. A purity of 55–60% tannin content is considered normal for extracts from sound Douglas Fir bark. For maximum yields and purity, the bark must be removed from the logs and dried soon after felling.

3969. Kiefer, H. J., and Kurth, E. F. **The chemical composition of the bast fibers of Douglas-Fir bark.** *Tappi* 36 (1), 1953 (14–9). 16 refs. P.R.

The extractive content of the bast fibres has been found to be 13·5%, compared with an extractive content of over 40% in the cork fraction of the bark. The bast fibres seem to be a lignocellulosic material with a high lignin content. At least three different 'lignin' materials are present in them. Concentric rings or layers are present in the cell wall of bast fibres. Their lumen appears to contain living protoplasm. The fibres are surrounded by a matrix of a reddish-brown phenolic acid.

3970. Chapon, S., and David, S. Étude de l'insaponifiable de l'écorce d'aulne, *Alnus glutinosa.* **[The unsaponifiable part of the bark of *A. glutinosa*.]** *Bull. Soc. chim. France* 20 (3), 1953 (333–4). 8 refs. [F.f.] O.R.S.

3971. White, D. E., and Zampatti, L. S. **The chemistry of Western Australian plants. Part VII. Oleanolic acid acetate from *Eucalyptus calophylla* bark.** *J. chem. Soc.* Dec., 1952 (5040). [University of Western Australia, Nedlands.] O.R.S.

Cf. *For. Abstr.* 14 (No. 981).

3972. Nair, P. V., and Punnoose, T. V. **Studies in the chemistry and utilization of Travancore minor forest products. Part IV. *Odina wodier* bark.** *Bulletin of the Central Research Institute, University of Travancore* (*Ser. A*) 1 (1), 1950 (87–102). 4 refs.

The chemical composition of the tannins was analysed, and the use of the bark as a dye and to preserve fish nets was investigated. Sun-dried bark has a tannin content of 8%. The bark extract can be used to dye cotton for shades from light brown to black, and it preserves fish nets from deterioration in salt water.

3973. Edwards, M. V., Badhwar, R. L., and Dey, A. C. **The vegetable tanning materials of India and Burma.** *Indian For. Rec.* (*Chem.*) 1 (2), 1952. pp. 189. Many refs. Price *Rs.*6 or 9*s.* 6*d.*

Contains chapters on: the tanning processes; factors influencing the choice of tanning materials; the occurrence of tannin in plants; methods of collecting tanning materials; tannin extracts; the factors influencing the supply of tanning materials from the forest; and Indian tanning materials.

3974. Gonzalez, R. M. Contenido en materia curtiente en corteza de *Acacia mollissima* de la provincia de Buenos Aires. **[Tannin content of bark of *A. mollissima* from Buenos Aires province.]** *Revista de la Facultad de Ciencias Químicas* (*Química y Farmacia*), *La Plata* 24, 1949 (1952), (177–83). 8 refs. [Span.] L.S.

Notes on the tree, its yield of tannin, its cultivation in Argentina, and yields and properties of the tannin obtained from samples taken from different localities in Buenos Aires province.

3975. Neebe, C. W., Luvisi, F. P., and Happich, M. L. **Tennessee Valley Oak bark as a source of**

tannin. *Journal of the American Leather Chemists' Association, Easton, Pa.* 48 (1), 1953 (32–41). 13 refs. B.L.M.R.A.

Presents tabulated results of a chemical investigation on the tannin content of the bark of *Quercus alba, Q. velutina, Q. falcata, Q. montana, Q. borealis, Q. marilandica, Q. coccinea,* and *Q. stellata.* Extraction of a composite representative sample of pure barks of the 8 species yielded 8·6% tannins of 58·3% purity. A tanning test gave encouraging results.

3976. Inal, S. Türkiye ve Yunanistanda palamut meşesi ve ekonomik önemi. [***Quercus aegilops* in Turkey and Greece and its economic importance.**] *Istanbul Üniv. Orm. Fak. Derg.* 2*A* (1), 1952 (107–25 + 4 photos + 1 map). [Turk.G.]

Discusses its distribution in Greece and Turkey, production of valonia and the organization of the trade, chiefly in Turkey. [Cf. *For. Abstr.* 13 (No. 3484).]

3977. Prat Roure, L. de. Distintas características de los corchos según su empleo industrial y tratamiento adecuado de los alcornocales con miras a su obtención. [**Different characteristics of cork, according to its uses in industry, and the management of Cork Oak stands, in order to obtain such characteristics.**] II Congreso Nacional de Ingeniería, Instituto de Ingenieros Civiles de España, Madrid 1950, Vol. IV, 1951 (247–57). [Span.]

Discusses the history of the cork industry in Spain, grading of cork, differences in quality, size, texture and colour, and treatment of the stands in order to obtain the types required in the market.

3978. Wilks, K. **Paper bark as a source of cork.** *Tech. Notes For. Comm. (Div. Wood Technol.) N.S.W.* 6 (1/2), 1953 (10–1).

Gives particulars of manufacture and properties of insulating blocks from bark of *Melaleuca leucadendron* and a table showing conductivities of loose chopped bark and pressed bark compared with other insulating materials.

892.5. Medicinal Plants, Edible Plants, Insecticides from Plants etc.

3979. MacDonald, R. E., and Bishop, C. J. **A further survey of plants for antibacterial substances.** *Canad. J. Bot.* 31 (1), 1953 (123–31). 13 refs. O.R.S.

Anti-bacterial activity of extracts from 177 Nova Scotian plants, including a number of trees and shrubs, against *Staphylococcus aureus* and *Escherichia coli* was tested. Results are tabulated. No relationship was found between pH and antibacterial activity. *Alnus crispa* was among the plants showing the greater activity and other trees with active extracts were *Acer* spp., *Betula* spp., *Juniperus horizontalis, Thuja occidentalis* and *Salix purpurea.*

3980. Fischer, G. Présence de substances antivirotiques dans différentes parties de plantes. [**Presence of virucidal substances in different parts of plants.**] *Annales de l'Institut Pasteur, Paris* 82, 1952 (119–20). [F.] [Karolinska Institutet, Stockholm.] O.R.S.

Describes in detail the antibiotic effect of fruits of *Acer platanoides* on a bacteriophage and on *Bacillus coli.* [Cf. *For. Abstr.* 14 (No. 2898).]

3981. Hartwell, J. L., Johnson, J. M., Fitzgerald, D. B., and Belkin, M. **Podophyllotoxin from *Juniperus* species; savinin.** *J. Amer. chem. Soc.* 75 (1), 1953 (235–6). [National Cancer Institute, Bethesda, Maryland.] O.R.S.

Podophyllotoxin, a tumour-damaging component of podophyllin was isolated from Savin (dried needles of an evergreen stated to be *J. sabina*), *J. virginiana, J. lucayana, J. scopulorum* and *J. sabina* var. *tamariscifolia,* male plant. Savinin, a new substance inactive towards tumours was also obtained from Savin. [Cf. *For. Abstr.* 14 (No. 1754).]

3982. Webb, L. J. **An Australian phytochemical survey. II. Alkaloids in Queensland flowering plants.** *Bull. Commonw. sci. industr. Organ. Aust.* No. 268, 1952. pp. 99. 29 refs.

[Cf. *For. Abstr.* 12 (No. 3275).] Results of tests on 1040 species of angiosperms are tabulated and discussed. Nine families, mainly of rain-forest species, were outstandingly rich in alkaloids. Fourteen genera (13% of those tested) of commercial trees contained alkaloidal substances. Alkaloids were lacking in all species of 60 families (43% of those tested). Small amounts occurred in a large number of species.

3983. Ewing, J., Hughes, G. K., Ritchie, E., and Taylor, W. C. **The alkaloids of *Cryptocarya bowiei* (Hook.) Druce.** *Aust. J. Chem.* 6 (1), 1953 (78–85). 13 refs. P.R.

3984. Bick, I. R. C., Doebel, K., Taylor, W. I., and Todd, A. R. **Alkaloids of *Daphnandra* species. Part IV. Observations on repanduline.** *J. chem. Soc.* Feb., 1953 (692–5). [University Chemical Laboratory, Cambridge.] O.R.S.

Cf. *For. Abstr.* 13 (Nos. 804–6).

3985. Bick, I. R. C., Taylor, W. I., and Todd, A. R. **Alkaloids of *Daphnandra* species. Part V. An examination of the alkaloidal content of *D. micrantha* and *D. tenuipes*. Isolation of some minor *Daphnandra* alkaloids.** *J. chem. Soc.* Feb., 1953 (695–700). O.R.S.

Cf. *For. Abstr.* 13 (Nos. 804–6).

3986. Lamberton, J. A., and Price, J. R. **Alkaloids of the Australian Rutaceae: *Acronychia baueri* Schott. IV. Alkaloids present in the leaves.** *Aust. J. Chem.* 6 (1), 1953 (66–77). 22 refs. P.R.

Cf. *For. Abstr.* 14 (No. 1765).

3987. Takahara, S., Kasuya, Y., and Shibata, S. [**Results of cultivating *Ephedra distachya* on coastal sand dunes of the South Boso peninsula.**] *Misc. Inform. Tokyo Univ. For.* No. 9, 1952 (1–6). [Jap.jap.e.]

Ephedra distachya, both with stems cut off and entire, were planted at different distances from the sea in 1950. A year later survival was about 70–80% for autumn planting, with no significant differences caused by location or stem cutting; transplanting during the growing season gave very poor results. The entire transplants showed no

difference in development (based on green weight) with the site, whereas cut ones developed better with increasing distances from the sea. Stems in the whole area averaged 0·759% total alkaloid including ephedrine. The total alkaloid content appeared to be higher in autumn; transplanting then and cutting off the stems for medicinal use is therefore suggested. *E. distachya* is as valuable as 'sand' grasses for stabilizing sand-dune areas.

3988. PARIS, M. R., and MOYSE-MIGNON, H. À propos des feuilles de Baobab (*Adansonia digitata* L.). Composition chimique et action physiologique. **[Leaves of *A. digitata*. Chemical composition and physiological effects.]** *Annales Pharmaceutiques Françaises, Paris* 9 (7/8), 1951 (472–9). 21 refs. [F.] L.S.

3989. HAUENSTEIN, H., HUNGER, A., and REICHSTEIN, T. Evonomosid aus den Samen von *Evonymus europaea* L. **[Evonomoside from seeds of *E. europaea*.]** *Helv. chim. Acta* 36 (1), 1953 (87–90). 6 refs. [G.g.] O.R.S.

3990. PARIS, M. R. Composition chimique du tégument séminal et du péricarpe de marron d'Inde (*Aesculus hippocastanum* L.). **[Chemical composition of the seed coat and the pericarp of *A. hippocastanum*.]** *Annales Pharmaceutiques Françaises, Paris* 9 (2), 1951 (124–8). 13 refs. [F.] L.S.

892.6. Resin and Turpentine. Essential Oils. Fixed Oils and Fats. Gums. Latex. Dyestuffs. Sap Sugar

See also Nos. 3063, 3674, 3852.

3991. GIBSON, A. J. **The Pine forests of the [British] Commonwealth [of Nations] as a source of rosin and turpentine.** *Emp. For. Rev.* 31 (3; 4), 1952 (192–5; 311–4); 32 (1; 2), 1953 (28–34; 118–23). 23 refs.

Surveys the sources of rosin and turpentine in the countries of the Commonwealth, species tapped and methods used, and briefly discusses the chemistry and uses of these substances.

3992. MIROV, N. T. **Composition of gum turpentines of Pines. XIV. A report on 3 Mexican Pines: *Pinus ayacahuite, Pinus cembroides* and *Pinus pinceana*.** *J. Amer. pharm. Ass.* (*sci. Ed.*) 41 (12), 1952 (673–6). 6 refs. O.R.S.

Cf. *For. Abstr.* 13 (No. 4423).

3993. ILOFF, P. M., JR., and MIROV, N. T. **Composition of gum turpentines of Pines. XVI. A report on *Pinus oocarpa* and *P. pseudostrobus* var. *oaxacana* from Chiapas and *P. cooperi* from Durango.** *J. Amer. pharm. Ass.* (*sci. Ed.*) 42 (1), 1953 (46–9). 5 refs. O.R.S.

Cf. *For. Abstr.* 13 (No. 4423).

3994. VARICAK, T., and PEJOSKI, B. **Production of Pine resin balsams for microscopical and optical uses.** *Stain Technology, Geneva, N.Y.* 26 (4), 1951 (225–9). 9 refs. O.R.S.

A method of obtaining balsam from the crude resin of Jugoslavian Pines is described. The quality and refraction of these balsams are good and they can be used instead of Canada balsam and Cedar oil for microscopic work. Balsam from *P. peuce* is considered the best, but those from *P. halepensis, P. leucodermis, P. nigra,* and *P. sylvestris* have very similar properties. Tables are given showing physical properties of the balsams, yields obtained and their content of rosin and turpentine. [Cf. *For. Abstr.* 14 (No. 1773).] *From author's summary.*

3995. **[Extraction of oleoresin from the gum-oleoresin of *Boswellia serrata*.]** *For. Res. India 1948/49, Part 1* 1952 (82–3).

Comparative yields by solvent (alcohol) extraction and hot (120–130° C.) expression are detailed. [Cf. *For. Abstr.* 10 (No. 2170).]

3996. SHAW, A. C. **The essential oil of *Thuja occidentalis* L.** *Canad. J. Chem.* 31 (3), 1953 (277–83). 9 refs. P.R.

3997. BLUMANN, A., MICHAEL, M., and WHITE, D. E. **The chemistry of Western Australian plants. Part VIII. The essential oil of *Eucalyptus eudesmioides* bark.** *J. chem. Soc.* March, 1953 (788–9). [University of Western Australia.] O.R.S.

3998. BIRCH, A. J. **The volatile oil of *Metrosideros scandens*.** *J. chem. Soc.* Feb., 1953 (715). O.R.S.

3999. NAIR, P. V., PILLAI, K. S. M., and VARIER, N. S. **Studies in the chemistry and utilization of Travancore minor forest products. Part III. Essential oil from *Adenosma capitata* Hook.f.** *Bulletin of the Central Research Institute, University of Travancore* (*Ser. A*) 1 (1), 1950 (79–86). 2 refs.

4000. PUNTAMBEKAR, S. V., and BATRA, P. C. **Chemical examination of the fatty oil from the seeds of *Sterculia urens* Roxb.** *Proc. Indian Acad. Sci.* 36*A* (4), 1952 (284–8). 8 refs. O.R.S.

4001. **[Analysis of the oil from *Semecarpus travancoricus* fruit.]** *For. Res. India 1948/49, Part 1* 1952 (84–5 + tbl.).

The oil is suitable for use in the manufacture of drying varnishes, stove enamels and moulding powders. The available supplies are indicated.

4002. FAROOQ, M. O., and VARSHNEY, I. P. La saponine et la sapogénine du péricarpe des fruits d'*Albizzia lebbek* Benth., 1re partie. L'isolement d'une nouvelle sapogénine, l'albizziagénine. **[The saponin and sapogenin from the pericarp of the fruits of *A. lebbek*, Part I. The isolation of a new sapogenin, albizziagenin.]** *Bull. Soc. chim. France* 20 (3), 1953 (301–2). 12 refs. [F.f.] O.R.S.

4003. **[Gums from *Sterculia* spp.]** *Rep. For. Dep. Nyasald. 1951*, 1952 (14).

Gums from *Sterculia quinqueloba, S. africana* and *S. appendiculata* have been investigated. That from *S. quinqueloba* had similar properties to those of the *karaya* gum obtained from *S. urens* in India.

4004. ANDERSON, E., and LEDBETTER, H. D. **The composition of Sapote gum.** *J. Amer. pharm. Ass.* (*sci. Ed.*) 40 (12), 1951 (623–5). 7 refs. O.R.S.

The gum [Goma de Kanaquil, Peru] collected from trees [unspecified] growing near the Equator at ca. 3000 ft. contains 90–94% water-soluble polyuronide and 6–10% water-soluble resin. It appears after the removal of the chicle-yielding latex.

4005. HUGUET, L. L'arbre à pâte à mâcher. **[The chewing-gum tree.]** *Rev. for. franç.* 4 (12), 1952 (803–12 + 1 photo + 1 drawing). [F.]

An account of *Achras zapota* and the latex industry in central America.

4006. NAIR, P. V., PILLAI, M. S., and PILLAI, K. S. M. **Studies in the chemistry and utilization of Travancore minor forest products. Part I. Indigenous rubber-yielding plants of Travancore.** *Bulletin of the Central Research Institute, University of Travancore (Ser. A)* 1 (1), 1950 (60–8). 3 refs.

Gives data on the latex obtained from *Alstonia scholaris*, *Tabernaemontana heyneana*, and *Cryptolepis buchananii*.

892.7. Fruits, Seeds. Fibres, Yarns and Flosses

See also No. 3737.

4007. GUHA SIRCAR, S. S., and CHAKRAVARTY, T. **The chemical investigation of the seeds of *Swietenia macrophylla* Part I. The non-bitter principle.** *Journal of the Indian Chemical Society, Calcutta* 28 (4), 1951 (207–10). L.S.

893. *Animal Products*

4008. NAIR, P. V., PILLAI, M. S., and NAIR, C. S. B. **Studies in the chemistry and utilization of Travancore minor forest products. Part II. Clarification, storage, and composition of forest honey.** *Bulletin of the Central Research Institute, University of Travancore (Ser. A)* 1 (1), 1950 (69–78). 4 refs.

Includes analyses of honey from four species of bee and suggestions for modernizing forest collection and processing.

9. FORESTS AND FORESTRY FROM THE NATIONAL POINT OF VIEW. SOCIAL ECONOMICS OF FORESTRY

90. GENERAL

4009. SEVNIK, F. Urejevanje naših gozdov ob prehodu v socialistično gospodarstvo. [**Forest management during transition to socialist economy.**] *Izv. gozd. Inst. Sloven.* No. 1, 1947/49 (1950), (91–112 + 1 map). 25 refs. [Sloven.russ.f.]

In accordance with a law of 1945, all six federal republics of Jugoslavia were divided into forest-economic provinces, regions, districts, and compartments. Slovenia was divided into 17 regions, 16 of which have well-developed productive forests, while the 17th is the Karst. The federal law of 1946 provided for a general inventory of forests, a long-range and a 5-year plan of forest management. Some statistics (area, volume and increment, species representation etc.) are given for the forests of Slovenia.

The five-year forestry plan, based on the inventory, envisages that the main silvicultural system will continue to be selection, but for Beech and Spruce some form of shelterwood system will be adopted. Pure stands must be converted to mixed. The annual yield is to be determined by the *méthode du contrôle*.

4010. DIKER, M. Die geschichtliche Entwicklung der türkischen Forstwirtschaft. [**The historical development of Turkish forestry.**] *Z. Weltforstwirt.* 16 (1), 1953 (15–21). [G.e.f.]

A summary of part of a work in Turkish. [See *For. Abstr.* 13 (No. 831).]

4011. CHAMPION, H. G. **Forestry in post-war India and Pakistan.** *Brit. agric. Bull.* 6 (25), 1953 (50–9).

Reviews some of the problems facing forestry in India and Pakistan, as revealed during the author's 3-months' tour in 1952. Questions considered include: adjustments for excess felling during the war, increase of state forests, control of private forests, reforestation of denuded areas, development schemes and land-use planning, increased industrialization and mechanization, shortage of trained staff, labour and research problems, wildlife conservation, public education, administration and finance.

4012. **The national forest policy of India. I. The background. II. Old policy and new approach. III. Resolution.** Govt. of India Press, New Delhi. 1952. pp. ii + 53. Price *As.*7 (8*d.*).

An account of general forestry conditions in India, and the old and new official forest policies. [Cf. *For. Abstr.* 14 (No. 886).]

902. *History of Forests and Forestry*

See also No. 4010.

4013. GIBSON, J. M. **The history of forest management in New Brunswick.** University of British Columbia, Vancouver. 1953. pp. 14.

The H. R. MacMillan Lectureship in Forestry, 1953 (1).

903. *Forest Policy, General*

See also No. 4012.

4014. GREELEY, W. B. **Forest policy.** McGraw Hill Book Co., New York. 1953. pp. viii + 278. 66 refs. Price $5·50 (£2. 4*s.*).

About half the book deals with the forest policy of the U.S.A., and there are shorter sections on the forest policy of Germany, France, Switzerland, Russia, Japan, Scandinavia, Britain and Canada, and forest policies in S. America.

4015. BADRÉ, L. Principes d'une politique forestière dans les hautes Vosges alsaciennes. [**Principles of forest policy for the Alsatian Vosges.**] *Rev. for. franç.* 5 (4), 1953 (245–56). [F.]

904. *General Regional Accounts of Forests and Forestry*

See also Nos. 2960–1, 2968.

4016. MOUTON, G. Un cas particulier de la sylviculture britannique: la sylviculture anglaise. [**A particular facet of British forestry: forestry in England.**] *Rev. for. franç.* 5 (6), 1953 (393–410). [F.]

4017. MOOSMAYER, V.; KRAUSS, G. A.; HAUFF, R.; KOCH, J.; MÜLLER, K.; OLBERG, R.; RONDE, G.; SCHÖNHAR, S.; WALDBURG ZU WOLFEGG-WALDSEE, ERBGRAF M. VON. Zeil: Standort, Wald und Waldwirtschaft in fürstl. Waldburg-Zeilschen Forst. [**Zeil: Site, forest and forest management in the Waldburg/Zeil forest.**] *Mitt. Ver. forstl. Standortskart.* No. 3, 1953 (3–44). 40 refs. [G.g.]

Comprises papers by the different authors on topography, climate, geology and soils, present plant associations and those shown by pollen analyses, history and prehistory, site types, earthworm populations (to be published in more detail elsewhere), species grouped by ecological requirements, the change from Spruce and clear-felling to mixed stands and selection management, differentiation in forest management based on the new site classification [cf. *For. Abstr.* 14 (No. 939)]; and differences in growth in Spruce stands on two site types.

4018. JÄNICHEN, H.; MÜLLER, S.; SCHLENKER, G.; SEBALD, A., *et al.* Die Waldstandorte des nördlichen Härdtsfeldes (Nordostalb). [**Forest sites in the N. Härdtsfeld (N.E. Swabian Alps).**] *Mitt. Ver. forstl. Standortskart.* No. 1, 1951. pp. 36 + 1 dgm. + 5 tbls. [G.]

Consists of a general introduction to the district, and sections by different authors on: geology; the forest soils; forest history; plant associations and ground vegetation types; species grouped by ecological requirements; site types; and silvicultural treatment.

4019. **Report on Japan's forestry.** Forestry Agency, Ministry of Agriculture and Forestry, Tokyo. 1952. pp. 168. [E.]

Contains sections on: forest administration, forest policy, legislation, forest products (including extraction and transport), silviculture (afforestation and

protection), erosion control, labour, finance, education, and research and statistics. A number of data on the various sections are given in tables.

4020. SINGH, J. **A short tour note [on a tour in Kulu Forest Division, E. Punjab, Sept.-Oct. 1951].** *Punjab For. Notes* 1951. pp. 14.

4021. Rapport sur les forêts et le service des Eaux et Forêts au Vietnam. **[Report on the forests and the Forest Service in Vietnam.]** Ministère de l'Agriculture, Direction des Eaux et Forêts, Vietnam. 1952. pp. 27 + 7 + 5 tbls. [F.]

Includes a list of the principal species, with density of the wood and uses.

905. *Forest Statistics and Resources*

See also Nos. 2967–8, 4009.

4022. **Census of Woodlands 1947–1949. Woods of five acres and over: Welsh county details.** *Census Rep. For. Comm., Lond.* No. 3, 1953. pp. 90. Price 4*s*.

Supplementary to Report No. 1. [Cf. *For. Abstr.* 14 (No. 2932).]

4023. NÄSLUND, M. Sveriges skogstillgångar. **[Sweden's forest resources.]** [*Skrift,*] *Industriens Upplysningstjänst, Stockholm* (*Serie C*) No. 6, 1951. pp. 132. 22 refs. [Sw.] Price *Kr*.3·50.

Data for S. Sweden, N. Sweden, Småland, the rest of the country, and Sweden as a whole, are presented in tables and graphs and discussed. The development of the wood industries, silvicultural means of increasing future production, forest policy and forest administration are also briefly discussed.

4024. **[Swiss forest statistics for 1950.]** *Schweiz. Forststatist.* 13 (1), [1951?]. pp. 40. [G.F.]

Cf. *For. Abstr.* 14 (No. 895).

4025. COLLINS, A. E. **Forest resources of northern British Columbia (a preliminary reconnaissance).** *Emp. For. Rev.* 32 (1), 1953 (21–7 + 10 photos). 3 refs.

4026. **Forest statistics for Arkansas: a report of the Southern Forest Survey.** *For. Surv. Release Sth. For. Exp. Sta.* No. 71, 1953. pp. 50.

4027. HORN, A. G. **Commodity drain from forests of the Lake States 1950.** *Misc. Rep. Lake St. For. Exp. Sta.* No. 18, 1952. pp. 24.

Tabulates figures showing by species and states the drain on growing stock, caused by cutting for different commodities and the actual production of such commodities.

91. LAND USE, LAND-USE POLICY (INCLUDING AFFORESTATION POLICY

4028. Mapa agronómico nacional de España. Masas de cultivo y forestales. Navas de Oro. **[National land use map of Spain. Areas under cultivation and under forest. Navas de Oro.]** Comisión Directora del Mapa Agronómico Nacional. 1951. Scale 1 : 50,000.

Cf. *For. Abstr.* 14 (No. 2989).

4029. HOME, SIR J. M. **The correlation of afforestation and agricultural land improvement.** *Brit. agric. Bull.* 5 (24), 1953 (339–42).

Discusses various aspects of this problem in Britain, including the use of bracken-covered areas for afforestation; the conversion of old woodland to agricultural purposes; protection against rabbit damage; and the possibility of encouraging the repopulation of remote, upland areas by employing men in afforestation projects.

4030. BOUCHET, C. Lugos, commune des landes de Gascogne. (Deux siècles d'évolution économique et sociale). **[Lugos, a commune of the landes of Gascony. Two centuries of economic and social evolution.]** Editions Delbrel, Bordeaux. 1952. pp. 250 + 110 photos + 40 dgms. and maps. [F.] Price *Fr*.2000 [£2. 10*s*.]

A detailed survey, laying particular emphasis on the deleterious effect of excessive afforestation on the pastoral and agricultural activities of the district. Recent disastrous fires have made clear the dangerously lopsided development of the local economy.

4031. MOURGUES, G. Le nomadisme et le déboisement dans les régions sahéliennes de l'Afrique Occidentale Française. **[Nomadism and deforestation in the Sahel regions of French West Africa.]** *Comptes Rendus, 1ère Conférence Internationale des Africanistes de l'Ouest, Paris* 1, 1950 (139–67 + 12 plates). [F.] Published by the Librairie d'Amérique et d'Orient Adrien-Maisonneuve, 11 rue Saint-Sulpice, Paris, 6e. Sponsored by the Institut Français d'Afrique Noire, Dakar.

Discusses causes of the destruction of vegetation in the Sahel with particular reference to nomadism and overgrazing; considers the possibilities of reforestation and some of the natural and human obstacles that would hinder the implementation of a successful reforestation scheme; describes the results of some attempts to protect vegetation and offers some suggestions for the protection of *Acacia* and for reforestation with *Acacia senegal*.

92. FOREST OWNERSHIP AND OWNERSHIP POLICY

4032. **Bibliography of published sources relating to African land tenure.** H.M. Stationery Office, London. 1950. pp. 156. Price 4*s*.

4033. **[Map showing] Forest reserves, protected forests and soil conservation areas.** Surveys and Lands Department, Sierra Leone. 1951.

93. PUBLIC SUPERVISION AND REGULATION OF FORESTRY, INCLUDING LEGISLATION FOR THESE PURPOSES

See also No. 2962.

4034. **A Bill intituled An Ordinance to provide for the protection and management of the forests of the Colony, and to regulate the taking of forest produce.** *3rd Supplement to the Government Gazette, Colony of Sarawak* No. *B*.16, 1953 (117–62).

4035. GRANDCOURT, O. DE. Indemnités pour passage de lignes en forêt. **[Compensation for power-line rights-of-way in the forest.]** *Rev. for. franç.* 5 (6), 1953 (434–42). [F.]

Discusses, purely from the legal point of view, 3 judgments (text given) given in 1947, 1951, and 1953, in French courts.

94. OTHER METHODS TO IMPLEMENT FOREST POLICY

943. *Forest Insurance*

4036. García Escudero, P. El seguro de incendios en los montes. [**Forest fire insurance.**] *Montes, Madrid* 8 (47–48), 1952 (329–36; 405–11); 9 (49), 1953 (13–22). [Span.]

Describes the working of existing insurance companies in Guipúzcoa and Vizcaya, comments on insurance systems already functioning in other countries, and gives an account of attempts to form a national insurance system in Spain, adding a summary of a report prepared by the national agricultural insurance service, 'Servicio Nacional de Seguros del Campo', which was formed in 1940. The calculation of risks, based on statistics for forest fires, is discussed and a summary is given of the organization of the California forest fire control service. The author is of the opinion that only the State can shoulder the risks of forest fire insurance, and he defines the main points of a suggested organization. Three classes of insurance are considered, viz. (1) young stands needing complete regeneration, (2) stands constituting commercial or non-commercial capital, and (3) stands yielding revenue. The study ends with a discussion of methods of valuing different types of stand, premiums, duration of controls, the payment of compensation, and the reforestation of burnt areas.

945.2. *Publicity, Propaganda*

4037. **World festival of the trees: summary of replies so far received from member governments.** *Docum. FAO Asia-Pacif. For. Comm. 1952* No. 69, 1952. pp. 6. Limited distribution: FAO, Rome.

Member governments of FAO (not only in the Pacific area) were asked to state the present position and arrangements in their respective countries, for 'Arbor days' etc.

945.3. *Education. Training*

4038. Krueger, M. **Trends in forestry education in North America.** *J. For.* 51 (6), 1953 (404–7).

4039. **Forest officer.** Careers for Men and Women Series, Ministry of Labour and National Service, London, No. 21, 1953. pp. 12. Price 6*d.*

Gives particulars of training facilities, university courses, etc., in Great Britain.

4040. Neidhardt, N. Studij šumarstva na sveučilištu u Zagrebu. [**Forestry studies in the Zagreb University.**] *Šum. List* 76 (12), 1952 (459–67). [Croat.e.]

History, and curricula of the forestry and forest products sections of the Faculty of Forestry.

945.4. *Research*

See also Nos. 3639, 3670.

4041. Cividini, R., and Wraber, M. Gozdarski institut Slovenije v letih 1947–49. [**The Forest Institute of Slovenia in 1947–9.**] *Izv. gozd. Inst. Sloven.* No. 1, 1947/49 (1950), (1-22). [Sloven.russ.f.]

The Institute, founded in 1947, is subordinated to the Ministry of Agriculture and Forests. In 1950, its staff consisted of 7 specialists, and 18 members of lower grade. It is subdivided into 6 sections: silviculture; forest protection; forest management; utilization and woodworking, economy and planning; plant sociology, pedology and meteorology. The Institute has 6 experimental stations, 4 substations, and 3 research areas; it manages 6 forests and arboreta.

4042. **The Petawawa Forest Experiment Station.** *Misc. Publ. For. Br. Can.* No. 3, 1952. pp. 27 + map.

An account of the station, its experimental forest, and current research activities.

4043. **The work of the California Forest and Range Experiment Station.** California Forest and Range Experiment Station, Berkeley, Calif. 1952. pp 12.

A brief account of the work of the different divisions and branch stations.

946.2. *Conferences and Excursions*

See No. 3670.

95. FOREST TAXATION

4044. Williams, E. T. **The small timber owner and his federal income tax.** *Agric. Handb. U.S. Dep. Agric.* No. 52, 1953. pp. 55.

97. INTERNATIONAL FOREST POLICY AND OTHER INTERNATIONAL COLLABORATION

971. *Congresses. Conferences*

4045. **Proceedings of the sixth British Commonwealth Forestry Conference, Canada, 1952.** Queen's Printer, Ottawa. 1953. pp. 374. Price $2·00.

Verbatim reports of discussions, and formal resolutions. Texts of statements and papers presented to the Conference are not included.

4046. **Sixth British Commonwealth Forestry Conference, Canada, 1952: Summary report, resolutions, reports of Committees.** Queen's Printer, Ottawa. 1953. pp. 71. Price $1·00.

Includes the list of representatives and of statements and papers presented.

4047. **African Regional Scientific Conference, Johannesburg October 17 to October 28, 1949. Vol. I. Proceedings and resolutions. Vol. II. Statements and communications.** Government Printer, Pretoria 1950. pp. 127 + 469. [E.e.f.]

Among the papers of forestry interest are the following:—Proposals for expansion of agricultural and forest hydrological research in Africa (*C. L. Wicht* [cf. *For. Abstr.* 12 (No. 1684)]; The water cycle as affected by land use (*R. R. Staples*); Timber investigations in the Union of South Africa (*M. H. Scott*) [cf. *For. Abstr.* 12 (No. 334)]; Possibilities for co-ordinated Wattle research in the African region (*H. Shaw*) [cf. *For. Abstr.* 11 (No. 3147)]; The work of the Forest Products Research Laboratory in the African colonies (*F. Y. Henderson*) [cf. *For. Abstr.* 12 (No. 1995)].

4048. **Report of the second session of the Asia-Pacific Forestry Commission, Singapore/Kuala Lumpur 1-13 December, 1952.** FAO, Rome. 1953. pp. 44.

Includes a list of the papers and statements presented.

4049. Groupe des experts du châtaignier: rapport de la première session. **[Group of Chestnut experts: report of the first session.]** FAO, Rome. 1951. pp. 50. [F.]

Includes the following papers: Chestnut-growing in the Avellino, Salerno, and Monte Amiata districts (*A. de Philippis*, pp. 23–8); Chestnut-growing in the Lucca district (*E. Allegri*, p. 29); Control of *Endothia parasitica* in Italy—observations on the appearance of resistant strains of *Castanea sativa* (*A. Biraghi*, pp. 31–6); The protection of Chestnut stands from ink disease and *Endothia parasitica* (*A. Arrigioni*, pp. 41–4); Indirect control of *Endothia parasitica* (*F. Fischer*, pp. 45–50).

4050. **Report of the 6th session of the International Poplar Commission, 1952.** FAO, Rome. 1953. pp. 74.

Includes the following reports: The transmission of Poplar diseases from one country to another (*R. Rol, H. van Vloten*, and *T. R. Peace*); Poplar identification and cultivation in Southern Italy (*R. Rol, A. Herbignat*, and *E. Allegri*); Poplar diseases and pests observed during the study tour in Southern Italy (*T. R. Peace, R. Regnier*, and *W. Vivani*); Poplar plantations in Jugoslavia (*J. Pourtet*); and Aspen in Finland (*R. Sarvas*).

References: 1. *Agricultural Institute Review*, Ottawa; 2. *American Forests*, Washington; 3. *British Columbia Lumberman*, Vancouver, B.C.; 4. *Cellulosa e Carta*, Rome; 5. *Colonial Development*, London; 6. *East African Agricultural Journal*, Nairobi; 7. *FAO publication*, Rome; 8. *India News*, London; 9. *Journal of Forestry*, Washington; 10. *N.R.C. Research News*, Ottawa; 11. *Press Release Department of Research and Development*, Ottawa; 12. *Quarterly Journal of Forestry*, London; 13. *Southern Lumberman*, Nashville, Tenn.; 14. *Soviet News*, London; 15. *Svensk Papperstidning*, Stockholm; 16. *Timberman*, Portland, Ore.; 17. *Times*, London; 18. *Wood*, London; 19. *World Crops*, London.

International.

More than 250 delegates are expected to attend the World Forestry Congress to be held at Dehra Dun at the end of 1954. The Congress will last a month, and subjects of discussion will include reclamation of degraded soils, desert control, shelterbelts, management of forest lands for wild life and for recreation, efficient methods of utilizing forest products, the status of woodworking industries based on forest products, and methods of silvicultural research (**8**; 27.6.53).

Conferences.

1953

25 June–1 July, FAO Working party on European timber trends: Geneva.

18–21 Aug., International Union of Biological Sciences—11th General Assembly: Nice.

2–9 Sept., British Association for the Advancement of Science: Liverpool.

5–10 Oct., FAO Timber Committee of E.C.E.: Rome.

8–10 Oct., FAO Timber Committee joint meeting with European Forestry Commission: Rome.

19–23 Oct., 1st International Congress for Plant Protection: Naples.

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July, I.U.B.S. Commission on applied ecology.

July–Aug., 5th International Soil Science Congress, Leopoldville, Belgian Congo.

Summer, International Union for the Protection of Nature, 4th General Assembly: Copenhagen.

1–8 Sept., British Association for the Advancement of Learning: Oxford.

Brazil. A corrugated-plywood press developed by a Brazilian, Dr. de Mello, and patented in Brazil and other countries, operates with heated plates like a flat plywood press but has a special device by which successive corrugation is carried out from the middle outwards. The plywood has been tested by the Institute of Technical Research, São Paulo. A pressure test along a line parallel to the corrugations showed that 2300 lb. pressure was needed to break a sheet 30 in. wide, 9000 lb. for a 40-in. and 18,000 lb. for a 20-in. piece. A pressure test in a line at right angles to the corrugations showed a breaking load of 2200 lb./sq. ft. Breaking load in a bending test was 1700 lb., for a piece 37 × 44 in. with the load concentrated in the middle. Corrugated plywood faced with aluminium can be made in the same press (**16**; June 1953).

Canada. For a number of years ranchers have believed that Pine needles cause abortion in cattle. A trial involving feeding with *Pinus ponderosa* needles has been carried out by the Department of Agriculture, and has given positive results. A further trial with *P. contorta* is in progress (**1**; May/June 1953).

Detailed studies in sawmilling have been in progress for some 18 months in a research sawmill of the circular headrig type, erected at the Forest Products Laboratory at Ottawa. Among the subjects so far investigated are: relationship between the specific gravity of wood being sawn and power requirements; relationship between bite and power requirements (**11**; June 1953).

Two new enzymes have been discovered in a wood-sugar fermenting organism. One of these (named "xylokinase") catalyses the phosphorylation of xylose, while the other (named "xylose isomerase") is responsible for its isomerization. Both are believed to be involved in the metabolic degradation of xylose (**10**; June 1953).

East Africa. At the end of 1952 a nursery course for foresters and forest officers was held at Muguga under the auspices of E.A.A.F.R.O. It was attended by 17 foresters and forest officers from the three mainland territories and Zanzibar and was considered to be a great success. The course lasted for a week and consisted of theoretical discussions and practical demonstrations in Muguga forest research nursery and arboretum. It is hoped to hold a second course in Nov. 1953, for about 10 days so that more time can be given to discussion (**6**; June 1953).

Great Britain. The county architect of the West Riding of Yorkshire has designed for the education authority a prefabricated wooden classroom that can be erected in a day. The classrooms, which will hold 40 pupils, are designed on a 4-ft. module and consist of resin-bonded plywood panels on hardwood framing, with a roof of stressed-skin plywood construction. All the parts can be easily manhandled into position. The rooms can readily be taken down and put up elsewhere as needed. At present 34 are in use as double and single units (**18**; July 1953).

The roof structure of the new extension wing at the Princess Mary Maternity Hospital, Newcastle-on-Tyne, demonstrates that large spans (37 ft. 6 in.) can be effectively roofed with timber trusses from normal commercial length specifications at a cost considerably below that of steel. The roof truss is built in two halves in the form of parallel booms or flange trusses, using small lengths of material. The main diagonal lengths are 7 ft. 9 in. long and the struts approximately 3 ft. 9 in. The two halves were prefabricated in the works of the contractor and carried to the site just before erection. Stacked side by side for transport they occupied a space only 23 ft. long, 3 ft. 9 in. high and 15 in. wide. The stipulated basic stresses under prolonged load are stress in flexure 1000 lb., shear parallel to the grain 100 lb., and compression parallel and perpendicular to the grain 1000 and 30 lb./sq. in. respectively. All contact areas are machine-planed and glued with Aerolite 300 and G.B.M. hardener (**18**; July 1953).

Lloyd's Underwriters have made a study of all the data available and have recently produced a standard forest fire insurance policy which, it is hoped, will meet owners' requirements at rates which they will be prepared to pay. The policy applies only to dedicated or approved woodlands, and incorporates two new ideas. The first is that when an owner decides to insure, he will be asked to cover all his woodlands under 25 years of age; the second, that he must take out his policy for a minimum of 3 years. Special arrangements can be made to cover woodlands over 25 years old. The basis of valuation is the net replanting cost plus the value of the annual increment. Annual rates vary from 2*s*. % for hardwood plantations to 10*s*. % for Pines. The average rate for a well wooded estate containing hardwoods, mixed woods, Larch and other conifers, would probably work out at about 5*s*. % over all (**12**; July 1953).

A house-owner of Ross, Herefordshire, has been awarded £75 damages with £50 costs at Hereford Assizes, for trespass and damage by the roots of a Poplar tree in the garden of a neighbour. He alleged that the roots had ruined his lawn and ornamental garden and had damaged drainage pipes (**17**; 24.6.53).

Hawaii. Redwood (*Sequoia sempervirens*) seed was sown 25 years ago on the bare slopes of an extinct volcano in Hawaii at elevations of 5000–6200 ft. Rainfall is about 30 in. annually, but water quickly runs off or sinks into the volcanic rock. Recent surveys show that the experiment has been remarkably successful. Some of the Redwoods have already attained a height of 45 ft. and are flourishing. One tree measured 70 in. g.b.h. (**2**; July 1953).

India. The Minister of Agriculture has urged the need for collecting as much Babul (*Acacia arabica*) seed as possible during the current season, and making arrangements for its distribution for sowing at the Vana Mahotsava week on wasteland, *nala* banks, roadsides and railway lands, grazing grounds and broken land and ravines, as a source of fuel (**8**; 27.6.53).

The Indian Air Force has completed its initial programme of sowing from the air 8 tons of seed as part of the effort to arrest the spread of the Rajasthan desert. According to officers of the Rajasthan forest department, dispersal and concentration on the required sowing area were satisfactory. The I.A.F. Dakota that carried out these flights was specially fitted with a seed container/ejector (**8**; 1.8.53).

The Assam Government has formed a Wild Life Advisory Committee to advise it in the matter of the preservation and protection of the wild life of Assam, which includes many rare birds and animals now at the point of extinction (**8**; 27.6.53).

The state-aided Nepa newsprint mill in Madhya Pradesh will have an estimated annual output of 30,000 tons when it goes into production in 1954. An estimate of Fir resources in the Punjab, Himachal, and Uttar Pradesh shows that 180,000 tons of pulpwood will be available annually. Cost of extraction is estimated at Rs.75 per ton for the Punjab, but the cost could probably be reduced by making use of winter logging, portable saws, Wyssen cableways etc. (**8**; 5.9.53).

Italy. In addition to the institute for research on Poplar growing at Casale Monferrato, the Italian pulp and paper industry (Ente Nazionale per la Cellulosa e per la Carta) has now set up a research station near Rome (the Osservatorio di Roma) for research into materials for pulp and paper manufacture. The station has the following sections: ecology; biology; microbiology; culture of plants for pulping; phytopathology and entomology; agricultural chemistry; wood technology. Research will be largely devoted to Poplar, with special reference to the possibility of growing it in depressed areas in Sicily, Sardinia, Apulia, Maremma and the Po delta (**4**; May 1953).

Nigeria. In 1952 a new sawmill was erected at Fawa in the Omo forest reserve ca. 100 miles N.E. of Lagos. The sawmill, subsidized jointly by the Colonial Development Association and concession holders, now converts timber (mainly *Terminalia superba*, *Sarcocephalus diderrichii* and *Erythrophleum* sp.) on the spot, thus avoiding the difficulty of transporting logs of these heavy non-floating species (**5**; Summer 1953).

Sweden. 'Spånit', a new building material from wood shavings and cement, is being manufactured by the Spånitbolag, Arvika. Blocks, beams, plaster and mortar can be made in any ordinary cement works. The new material, only $\frac{1}{3}$ as heavy as normal cement, is strong, elastic, and non-inflammable, and can be sawn and nailed. It has a low heat conductivity. The wood waste is treated with chemicals to remove materials (e.g. resin, and sugars) harmful to the cement. Spånit is already being used in the neighbourhood of Arvika for storage depots, cold-storage plants, and farm buildings (**15**; 15.6.53).

Switzerland. A training course for time-study experts in forestry work, organized by the Swiss Government, was to be held at Zürich from 30 August to 5 September. In view of the short time available the scope of the course was limited to providing a sound training in a single method of time-keeping and the interpretation of its results. Languages used were English, French and German (**7**; 8.8.53).

U.S.A. The Society of American Foresters is carrying out a project, financed by the Rockefeller Foundation, to survey the progress of forestry research in the U.S.A. during the past 25 years, to determine the scope of current research activities, and to forecast probable research needs during the next 25 years (**9**; June 1953).

A tree-planting machine has recently been supplied by Hartzell Industries, Piqua, Ohio, for landowners in Miami County. Its special feature is a horn, regulated by a spacing device fitted to the differential of the tractor, that gives a signal at exact intervals of 7 ft. or any other distance required. This provides for correct spacing of trees in the plantations (**13**; 15.6.53).

A method of propagating cuttings of tropical tree species under a continuous water spray, first reported in 1949, has now been developed in Florida with great success. The lower leaves are removed, and the cuttings are then placed in a light and open medium in a bin in full light. Under a continuous spray of water they will root in 3–6 weeks (**19**; May 1953).

Entomologists of the U.S. Department of Agriculture are planning new uses of radioactive isotopes to find out how far and how fast insects fly, how an insecticide kills an insect, and how some insects develop resistance to insecticides. An insect 'tagged' with one of the radioactive isotopes can be detected by a counting mechanism even when out of sight, e.g. under the bark of a tree. Similarly a 'tagged' insecticide can be traced in an insect's body, to show what physiological changes take place, or perhaps fail to take place as an insect develops resistance to an insecticide (**9**; August 1953).

Squirrels, which are a pest in the suburban areas of Washington, are being trapped in simple wooden box traps and released in the forests of Maryland, where their beneficial effect on natural regeneration (due to their habit of secreting nuts and seeds) outweighs their damage to trees. Boy Scout troops are paid 75 cents for each squirrel trapped and turned over alive to the State Game Commission (**2**; July 1953).

A member of a Tampa firm has designed and built an all-timber atomic bomb shelter. Tests of the shelter have been asked for. Theoretically it should give protection at 1000 yards from ground centre, it is claimed that it can withstand a blast 7 times as great as that at Hiroshima, and it will hold 6–8 people. It consists of short spans (maximum 2 ft.) of end-grain timber covered with a rounded earth surface. Treated timbers, plywood, felt and asphalt are used (**3**; June 1953).

U.S.S.R. P. Zakharov and V. Antonovich have developed a method for altering the colour of wood by injecting dyestuffs into the trunks of living trees. Pines and Birches treated in this way yield pale blue, brown or red wood. The colours are unaffected by time, sunlight, or water. Injection of other substances makes the wood extremely hard or so flexible that the tree can be bent down to the ground (**14**; 30.6.53).